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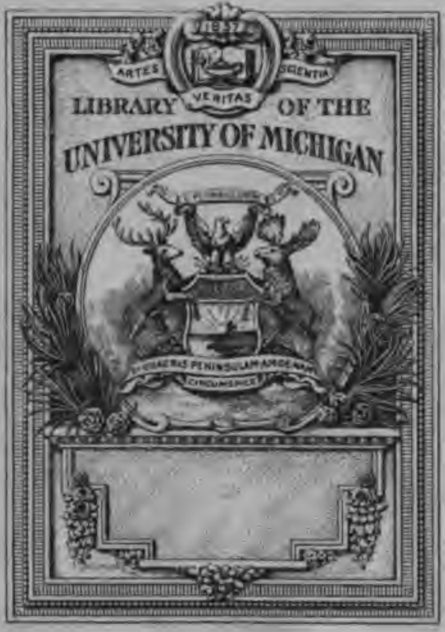

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The

Geographical Journal.

No. 1. JULY, 1902. Vol. XX.

ADDRESS TO THE ROYAL GEOGRAPHICAL SOCIETY.*

By Sir CLEMENTS R. MARKHAM, K.C.B., F.R.S., President.

The year that has now come to a close has witnessed an exceptional increase in the number of Fellows who have joined the Society, and a satisfactory corresponding increase both in income and expenditure. The Society has been able to enter upon a great geographical enterprise, indeed the greatest it has ever undertaken, and it has done this without seriously crippling its work in other directions. Yet the large sum of £8000 has been taken from our capital, in two sums of £5000 and £3000, as our contributions towards the expenses of a great national expedition. In addition we have been able to present the Antarctic Manual to the expedition at a cost of £250.

The Antarctic Expedition was fully and completely equipped for the important service on which it is employed, and nothing that could be thought of was omitted in the outfit, whether as regards scientific instruments and appliances, or the comfort and health of the explorers. The *Discovery* finally sailed from Port Chalmers, in New Zealand, on December 24, 1901, and is now wintering somewhere within the antarctic circle.

We cannot hope to receive any news of our friends until the spring of 1903, but we can make some attempt at a forecast of their proceedings. I drew up the draft of the Instructions for the Expedition in 1897, and made a few additions to the draft in January, 1901. These Instructions were revised by a select committee in April, 1901, but no material alterations were made. They were signed by the Presidents of the two societies, and I gave them to Captain Scott on August 3, 1901.

---

* Read at the Anniversary Meeting, May 26, 1902.

The main objects of the expedition are to determine, as far as possible, the nature and extent of that portion of the south polar lands which the ship is able to reach, and to conduct a magnetic survey. In performing this difficult service much is left to Captain Scott's discretion. The importance is dwelt upon of examining the ice mass which ends in the remarkable line of cliffs, and of prosecuting discoveries to the eastward of the furthest point reached by Sir James Ross in 1842. The question of wintering is left to Captain Scott's discretion, but he is instructed to use his utmost endeavours to explore the region within reach of his winter quarters, by sledge travelling in the spring. He is further informed that the presidents will use their best endeavours to carry out his wishes as regards provision for the safety of himself and his companions.

With reference to this promise, Captain Scott addressed a letter to the presidents dated December 17, in which he pointed out how absolutely retreat would be cut off if any accident resulted in the loss of the *Discovery*, unless a relief ship was sent to the antarctic regions in 1902–1903. He relies upon us to use every effort to despatch such a ship, and he left New Zealand, confident that such efforts will be successful, and that a line of retreat will be thus assured to him and those under his command.

In full reliance on this necessary help, Captain Scott had formed his plans before leaving New Zealand. He intended to endeavour to reach and force through the ice-pack on the 175th meridian, and on reaching the open water, to make for Cape Adare. If all has gone well the *Discovery* would have reached the pack on about the 5th of last January, have forced her way through in six days, or perhaps less, and have been off Cape Adare on about the 12th. He then intended to follow the coast southwards to McMurdo bay, where he should have been, or off Cape Crozier, on the 28th.

Captain Scott has caused a number of zinc cylinders to be made, about 18 inches long by 3, to contain records and to be deposited at Cape Adare, Possession Island, Coulman Island, Wood Bay, Franklin Island, and Cape Crozier, in case a landing should be possible early in the season at all or any of these places. But he did not intend to delay the ship, as he was impressed with the importance of pushing on. At Cape Crozier he intended to make as thorough an examination of the western end of the ice-wall as time and circumstances would permit.

From Cape Crozier his plan was to advance along the ice-wall to its eastern extremity, which he might have hoped to reach on about February 9, leaving him over three weeks more of navigable season. Beyond this point the movements of the *Discovery* will be quite uncertain.

Sir James Ross, at his furthest eastern point in 165° W., believed that he saw mountains of great height to the eastward, with a varied and undulating outline which the barrier itself could not have assumed. It may be that these eastern mountains form the eastern, as the Parry Mountains form the western, boundary of a vast gulf filled with the ice-mass of which the long cliff is its northern limit. In that case the land to the eastward would probably be of great extent, and, possibly, with a part of its coast-line facing east. In that case a ship might, under favouring circumstances, make great discoveries in the unknown region, and find winter quarters far to the south, on a coast-line facing to the east.

These possibilities have always been in my mind, and have often been discussed by me in conversations with Captain Scott. He certainly intended to force his way to the eastward if the condition of the ice enabled him to do so. There would have been risk in thus penetrating into an unknown region, and some danger of the loss of the ship; nor would he have run such risk unless he had received the assurance that he would not be left unsupported. But he did receive that assurance in paragraph 20 of the Instructions, and in the despatch from the Presidents dated October 29, 1901. Captain Scott has foreseen the possibility of a disaster to the *Discovery* in the unknown region, and of a retreat along the ice-wall to Victoria Land. In the event, therefore, of neither the ship nor records being found, the relief ship is to land two months' provisions at Cape Crozier, the same quantity at Cape Adare, but the bulk and all supplies of coal at Wood Bay. The provisions needed will be chiefly meat, flour, butter, and golden syrup.

It is possible that the *Discovery*, after wintering in the unknown eastern region, may succeed in forcing her way northward to safety in the ensuing navigable season with the drifting pack, without returning to the coast of Victoria Land.

Captain Scott may have found the pack pressed up against the ice-cliff in such a way that it was not possible for the ship to advance further east last February. In that case, after an examination of the eastern part of the ice-wall, the *Discovery* will probably have wintered either somewhere to the west of Cape Crozier in McMurdo Bay, or in Wood Bay, where there appear to be good winter quarters. Most valuable series of observations will have been taken in the winter, and a scheme of sledge-travelling for exploring the interior, the volcanic region, and the southern ice-field, will be organized. The relief ship will have no difficulty in finding the *Discovery* and supplying her with the stores and provisions of which she will be in need, if the winter quarters are in Wood Bay, or on any part of the coast between that position and Cape Crozier.

Further, most valuable work can then be done by both ships during the navigable season of 1903, before they finally shape a course northward.

It is quite clear, from these details, that the despatch of relief to any vessel wintering in polar regions is a necessity. This is well known to His Majesty's Government, for not only has this precaution always been taken in the cases of naval expeditions since 1848, but the Government has recognized it to be a duty to give assistance in sending relief to private explorers when in danger or distress. It is, of course, well known to us, and was foreseen from the first, as is shown by the draft Instructions drawn up in 1897, and revised in April, 1901, and by the letter of the Presidents to Captain Scott. In 1897, and again in 1898, I inspected the wooden ships in Norway, and ascertained that the *Morgen*, of Tonsberg, was the vessel best adapted for our purpose. But at that time the price asked for her was too high (£5400). In the circular, asking for subscriptions, which was issued by the Presidents in 1900, the sum required was fixed at £120,000, which included the cost of a relief ship. As soon as the equipment of the *Discovery* was nearly completed last May, the work of procuring the despatch of a relief ship in the following year was seriously taken in hand. Mr. Longstaff, with his usual munificence, began the subscription with £5000, and Mr. Thomason with £500. Since then the appeals to the Fellows of this Society have met with liberal and generous response, and their subscriptions have been supplemented by the general public. His Majesty the King and His Royal Highness the Prince of Wales are impressed with the necessity of sending a relief ship, and have subscribed to the fund. The Royal Society has given £500, and the principal City Companies have contributed. The Government of New Zealand has very generously placed £1000 on its estimates to be devoted to the expenses of the relief ship, and we cannot doubt that the legislature of that enlightened colony will heartily approve the proposal. But really the most gratifying subscriptions have been from officers in South Africa and on the Indian frontier, from Uganda and the Gold Coast, from men-of-war in all parts of the world, and from cadets. I wish to make my warmest acknowledgments to the sub-lieutenants at Greenwich. Finally, a munificent donation has come, when urgently needed, from Mr. Edgar Speyer. Last February I expressed a conviction that, although the Government may refuse any help, the people of this country would never allow their explorers to be abandoned to their fate. I was right; and we may now feel some confidence that the funds will eventually be adequate. The sum of £20,000 has been subscribed, but at least £22,000 will be needed.

The *Morgen*, or *Morning*, was still available, and could be secured for a much lower price than in 1897. I bought her last October for £3800. She was built especially for strength by the late Svend Foyn of Tonsberg in 1871; and, with the possible exception of the *Fram*, she is the strongest vessel that ever was built in Norway. The *Morning* had been employed in icy seas for thirty years, and had proved her strength and stability. She is 140 feet long, 31 feet width, and

16·7 depth; 437 gross tonnage. Since January she has been undergoing a thorough refit by Messrs. Green of Blackwall, and she will be ready to start by the first week in July.

In our associate, Captain William Colbeck, R.N.R., who received our Back Award last year for his excellent work as an observer in the Antarctic Regions, we have a very competent and reliable commander. He has the highest testimonials as a navigator and a sailor, and has already gained experience in the pack-ice of the southern ocean. The Admiralty has been so good as to lend us the services of a young naval officer, Sub-Lieutenant Edward Evans, full of zeal and activity. We have an experienced engineer in Mr. Morrison, and under Captain Colbeck's auspices the other posts will be well filled.

I must take this opportunity of expressing the thanks we owe to the Lords of the Admiralty for the help they have given, and the sympathy they have shown both with regard to the main expedition and to the relief ship. To this department of His Majesty's Government our warmest acknowledgments are due.

The *Morning* will proceed to Lyttelton in New Zealand, where she will be filled up with coals and provisions. I am particularly anxious to send down a good supply of fresh meat for our gallant explorers. I have had an insulating-room built on the upper deck, which is capable of containing 100 carcases of sheep, or 6000 lbs. of meat, with the necessary ice. I hope that by December the *Morning* will be off the pack-ice, and that Captain Colbeck will be able to force his way through and reach the open water to the south, earlier than any other vessel. He will then proceed to carry out his instructions, which will be based on the views and wishes contained in the letters we have received from Captain Scott. May all good fortune attend on Captain Colbeck and his companions in their humane and important mission. May they find our dear friends in the *Discovery* well in health and spirits, after having achieved great success; and may all return safe and sound to their native country, covered with imperishable renown.

Our warmest sympathies are also with the German Expedition, under the able command of my friend Erik von Drygalski. The *Gauss* spent a longer time than Captain Scott felt justified in doing on her way to Kerguelen Island, and did a considerable amount of deep-sea sounding and dredging. A magnetic base was established on Kerguelen Island, where the *Gauss* filled up with stores and provisions, and I have had the pleasure of receiving a farewell greeting from Dr. Drygalski, dated at that place. In the end of January the *Gauss* started on her antarctic voyage. Dr. Drygalski intended to enter the pack-ice to the east of Kemp Land, forcing his way south with the object of reaching some part of the coast of the supposed antarctic continent, and exploring the "Enderby Quadrant." This region is entirely unknown, and speculation as to the probable course of the expedition is, therefore, useless. A relief ship will be sent in the event of the absence of the *Gauss* being so prolonged as to cause anxiety. Meanwhile we wish the gallant German explorers all possible success.

I have mentioned on previous occasions the Swedish expedition which the nephew of our illustrious gold medallist, Baron Nordenskiöld, has been organizing for the last two years. Dr. Otto Nordenskiöld has already established his position as a scientific geographer by his exploring work in Patagonia. I had the pleasure of seeing and talking over his plans with him when he visited London last October. On the 26th he sailed from Falmouth in the *Antarctica*, a small vessel of 350 tons, and has since reached his destination on or near Graham island, in about 64° 5′ S., where he will winter on shore. The ship was sent back to the Falkland Islands, and before returning to pick up Dr. Nordenskiöld and his party next November, her captain will devote much time to dredging and soundings in the sea between Tierra del Fuego and the South Shetlands. Captain Larsen, of the *Antarctica*, is the same enterprising Norwegian seaman who made discoveries on the eastern side of Graham island in 1896 on board the *Jason*. Mr. Bruce has bought the small Norwegian whaler *Hecla*, sister ship to the *Antarctica*, with the object of exploring in the same Weddell Quadrant in which Dr. Nordenskiöld is already at work. The *Hecla* was built at Drammen, in Norway, in 1872, and is 139·6 feet long by 28·9, tonnage 355.

Turning to the opposite polar area, we find that the arctic regions are the scene of the labours of four expeditions. The *Windward* will shortly proceed to Smith Sound to bring back the Peary expedition. Lieut. Peary has already completed the discovery of the north coast of Greenland, which in itself is a great geographical achievement. This season he intends to make an attempt due north, and we all trust that he will return safely. Captain Sverdrup, in the *Fram*, has now been absent three winters, and his exact position is unknown. It is believed that he has proceeded up Jones Sound, in which case he may have done some interesting work. His return next autumn will be looked for with some anxiety.

An expedition under Mr. Baldwin has been fitted out at lavish cost, with the avowed object of reaching the north pole by the route of Franz Josef Land. This is not an object which has ever commended itself to the Council of this Society. We have always advocated the exploration of the unknown polar regions—not a rush towards one particular spot. The north pole itself is of no special interest with reference to its celestial phenomena, as they are well known. It certainly has no geographical interest, being merely a point on an ice-covered sea. It is not even the most difficult point to reach nor the most distant from the boundary between the known and the unknown. A series of deep-sea soundings to the pole and beyond it would be of scientific importance, but this could only be undertaken in a ship drifting with the current.

Baron Toll's expedition is likely to result in much more valuable scientific work. An interesting communication from him was recently published in our *Journal*, giving details of his first year's attempt to reach Sannikoff island to the north of the new Siberian islands. We await further news of his expedition.

Dr. Sven Hedin is on his way home from one of the most remarkable and successful expeditions ever undertaken in Central Asia. His maps alone, if spread out, would cover nearly a quarter of a mile. In other directions his researches are equally abundant, and I hope that he will come to us at the opening of our next session, and give us some account of the three years of magnificent work which he has brought to so successful a conclusion.

Perhaps one of the most important matters in connection with the exploration of Africa is the activity of the Foreign and Colonial Offices in organizing surveys of the extensive territories under their administration on that continent. The representations of the Council on the subject have, we may presume, had some influence in bringing about this result. Competent surveyors are now in demand, both for East and West Africa, and we may expect that, when the war is over, others will be required in South Africa. This ought to be known, for there is a dearth of competent surveyors, and it would be quite worth the trouble for young men, having the necessary preliminary education, to qualify for such work by going through a course of training under the Society's instructor. There are so many expeditions and so many agencies at work in the exploration of Africa, that it is not possible to refer to them in detail. But I ought to mention the completion of a remarkable survey, extending over some three years, by Mr. Beringer, who had to lay down the route for the trans-continental telegraph. He has made a most careful survey from lake Nyasa to Tanganyika, along the coast of that lake, across to the Victoria Nyanza, and on to the Uganda valley. His map, with many fixed points and accurate contours, on a large scale, is a most valuable acquisition, creditable alike to Mr. Beringer and to the enterprise of the British South Africa Company. Mr. Beringer is about to return to Africa to carry his work still further northwards.

Our Vice-President, Sir Thomas Holdich, is expected to return in a few weeks from his expedition to the Patagonian Andes, in connection with the Argentine-Chile Boundary arbitration. We may feel sure that so experienced a surveyor and so accomplished a geographer as he is, aided by his well-selected staff, will bring back many additions to our knowledge of a region of great interest. Much also may be hoped, from the geographical standpoint, from the well-equipped expedition sent to Bolivia by Sir Martin Conway, which is still at work.

One of the most interesting papers of the session was that of Mr. Stanley Gardiner on the Maldive Islands. These islands were visited, this year, by Mr. Alexander Agassiz, who has spent many years and thousands of pounds in the investigation of the principal coral islands on the globe. He has, I believe, completed his work. Some of the results of his visit to the Maldive islands have been given in the *Journal*, and when the full reports of his work, extending over many years, are given to the world, they will form a contribution of the first importance to geography, as well as to other departments of science.

I must also mention that Sir John Murray has made a beginning this year of his great enterprise which, with the support of Mr. Laurence Pullar, he has undertaken for the purpose of completing our knowledge of the lakes of the British islands. He has taken up his residence in the neighbourhood of Loch Raunoch, and we may hope soon to be in a position to publish some of the results. Similar work has been carried out for years on the Continent, and in this, as well as in many other directions, it is evident that a vast field still remains for geographical research.

But for the future advance of geographical research, whether in the field or in the study, we must look to reforms in the system of education. The persistent efforts of our Council to secure improvement in geographical teaching have been continuous during the last thirty years; but the first condition of success has been wanting, and is still wanting. In this country there did not, and does not yet, exist a body of enthusiastic teachers who have themselves mastered the subject under the direction of specialist professors in the Universities, and other places of higher education. The key to the position was evidently to be found in the initiation of geographical courses in the Universities. It can easily be seen, by reading either Dr. Keltie's report to the Society in 1885, or Mr. Mackinder's address to the British Association in 1895, that the Universities of Germany are more than a generation ahead of us in this respect.

Our efforts to induce the Universities to entertain the question were commenced in 1872, but for fifteen years, though several times repeated, they were fruitless. At length, with pecuniary help from our Society, the Readership in Geography was established at Oxford in 1887, and a Lectureship (since raised to a Readership) at Cambridge in 1888. Parallel efforts were made at the same time in France, and in the United States. Now, in the great re-organization of our English educational system which appears to be taking place, it would seem, from not a few indications, that the idea has at last been taken up, and that geography is to have a real chance. Under these circumstances it will be interesting to consider the important changes which have been or are being effected with regard to three Universities—those of Paris, Oxford, and

London. Mr. Mackinder has been so good as to furnish me with the following information on this subject:—

In Paris, at the Sorbonne, geography has been recognized for a number of years as a more or less subordinate, although a separate subject in the department of history, and Himly, the Professor of Geography, became the Doyen of the Faculty of Letters. Candidates for the *Licence-ès-Lettres* (equivalent to our B.A.) could take geography in connection with history, and it was also a subject in the competition, called the *Agrégation*, for the professorships in the *Lycées*, or great secondary schools. There was a second chair, practically of University rank, at the *École Normale Supérieure*, which was held by Vidal de la Blache. When he succeeded Himly at the Sorbonne, Gallois, who had been Himly's assistant, passed to the professorship at the *École Normale*.

In 1897 a fresh step was taken. Vélain was appointed Professor of Physical Geography in the Faculty of Sciences, and two years later he was in a position to begin the organization of a laboratory. A sum of about £1600 has been expended on the equipment of this laboratory, and not less than £600 on the provision of maps and other collections. Lately physical geography has been added to the list of sciences from which a candidate for the *Licence-ès-Sciences* (equivalent to our *B.Sc.*) must select three, and it has thus been placed on an equality with such subjects as zoology, botany, and geology, and at the same time freed from its dependence on geology. In the Faculty of Letters, on the other hand, a diploma in geography of a more advanced character than the *Licence* has been established, and the subject has thus, to a large extent, been emancipated from its former dependence upon history. Geography may also be taken for the newly established Doctorate of the University of Paris.

Although members of the separate faculties of Letters and Sciences, Profs. Vidal de la Blache and Vélain co-operate in such manner that while purely historical students attend the lectures chiefly of the former, and purely scientific students those of the latter, those who would become geographical specialists, or teachers in *Lycées*, attend both. Among the more distinguished students trained under this system are the young Professors of Geography at the Universities of Lille, Rennes, Lyons, and Nancy. Outside the University proper and the École Normale, there is a Catholic University where, probably owing to the deficiency of funds in a voluntary institution, M. de Lapparent is still Professor both of Physical Geography and Geology; and at the great École des Sciences Politiques there is a chair of Military Geography which is interesting for a special reason. The students of this school are candidates for the competitive examinations by means of which the civil and diplomatic services of France are recruited, and the chair has been established in order that those who become Prefects, perhaps of frontier departments, or officials in the

French Embassies, should know enough geography to grasp strategical considerations. There is also geographical teaching in Paris, under Prof. Marcel Dubois, for those who are about to proceed to the French colonies.

At Oxford more than a thousand undergraduates, reading for honours in history, have passed through the classes of the Reader in Geography during the last fifteen years. Geographical questions are set in most of the papers for honours in modern history, but it is to be regretted that a separate paper is not allotted to geography, and the subject thereby raised in dignity as part of the equipment of a historian. Three years ago, as an outcome of the co-operation of our Society with the University of Oxford, a School of Geography was organized. A laboratory was provided, and lecturers were appointed to assist the Reader. A Diploma has since been established of a fairly advanced character, probably corresponding to the Diploma initiated recently in the University of Paris. The students attending the courses need not necessarily be members of the University.

If the year of preparation which is to be required for the registration of teachers, under the new scheme of the Board of Education, proves to be a reality in the sense that it is made post-graduate, it appears not unlikely that a certain number of secondary teachers will take up the teaching of geography as a special subject, and will perhaps be able to obtain the Diplomas of the University of Oxford both in education and geography. In that case we shall have a course equivalent to the Paris course for the *Agrégation*. The newly established Research Degrees of the University are open to geographical students, and correspond to the new Doctorate of the University of Paris. But there will still be nothing quite equivalent to the position of geography in the Licence-ès-Lettres, and still less to that which it now holds in the Licence-ès-Sciences.

The number, however, of students who take the full diploma at Oxford must always be relatively small, nor is it desirable that it should be too easily awarded. It is, therefore, very satisfactory to observe that, despite the small encouragement given in the examinations, there are already a considerable number of students following the various courses of the School of Geography. There is naturally a drop in the attendance during the Summer Term, and it is, therefore, the more remarkable that whereas in the Summer Term of last year there were 36 names on the register, in the present term there are more than 70. In addition to the Reader there are now four lecturers: namely, Mr. Dickson, whose courses are on oceanography, climatology, and surveying; Mr. Herbertson, who lectures on regional geography and geomorphology; Mr. Beazley on the history of geography, and Mr. Grundy on ancient geography.

In the reorganized London University it is understood that geography is to have a place in the Faculty of Arts in connection with history, and an independent place in the Faculty of Economics. In the intermediate examination for the B.Sc. in the latter faculty, geography is a compulsory subject, and all candidates for honours in the final examination are required to attend a course of lectures on the application of geography to definite economic and political problems. For the first time, it will be possible for a geographical student in this country to follow his subject through all the stages of the University course, from matriculation to the Doctor's degree.

In the draft scheme for the Matriculation Examination, which was brought to my knowledge by Lord Avebury a few months ago, geography was omitted. Our Council then presented a memorial to the Senate of the University on the subject, and it is understood that geography has now been inserted, and that it holds an independent position in the list of options from which all candidates are required to select two. I believe that a considerable and beneficial pressure may thus be brought to bear upon the secondary schools, provided that the papers set are up to the modern standard, and not, on the one hand, of the purely descriptive type, or, on the other, so far given over to preliminary science that the essential topographical element is lost.

Other important educational institutions are certainly desirous of following the examples of the Oxford and London Universities. As chairman of the meeting of delegates of the British Geographical Societies last year, I had to send a circular letter to all the Universities and institutes for higher education in the kingdom, urging the desirability of including geography in their curricula. Very encouraging replies have been received to this letter. All admit the importance of geography as a subject for instruction. The University of Edinburgh contemplates the establishment of a chair. Others are doing what they can to give the subject a place, but they all plead that want of funds hampers their good intentions.

In accordance with a suggestion of the Education Committee last February, I appointed a Special Education Committee, including members of the Geographical Association and practical teachers in schools, together with members of our Council. This committee has resolved that a statement should be issued by it drawing special attention to what are believed to be the chief causes of the present unsatisfactory position of geography in education. It has also recommended that two sets of memoranda be drawn up for dealing with the subject of geographical teaching in secondary and in primary schools. Mr. Mackinder and Mr. Rooper have undertaken to prepare these important memoranda.

All this activity in endeavouring to raise the standard of geography in this country, and to give it a substantial place in education, has secured a large measure of success already. Public interest in the subject has been widespread. The utility of geography as a field of research has been proved. And all this must react upon our Society, which initiated the movement thirty years ago. We cannot afford to stand still, and as a matter of fact we have not stood still. In the papers read at our meetings those dealing with geographical research, as apart from exploration, have gradually increased in proportion, while it has been sought to impress upon explorers that pioneer work must, to a large extent, now give way to something more scientific. The Society's *Journal*, and our extra publications, bear evidence to these expansive views with regard to the field of our subject. While never losing sight of the fact that the main work of the Society, in the future as in the past, must be the promotion of the complete exploration of our globe, work which is necessarily becoming more detailed and more scientific as the pioneer stage is exhausted, still there is room for greater expansion in other directions.

The Council has been impressed with this fact for a considerable period, but it has been felt that the operations of the Society must necessarily be restricted so long as we are confined to the narrow space afforded by our present house. Repeated efforts have been made to take steps for obtaining or erecting a building worthy of our Society. Quite recently I made a strong appeal to the Government for the use of the building, as a home for the Society, which was vacated when the University of London was removed to South Kensington. But although the claims of the Society on the Government were admitted to be strong, my request was not complied with. It would seem that the erection of a suitable building is the only alternative left to us. Its dimensions and its arrangements must be such as to suit the varied requirements of the Society. Foreign geographers who visit this country express their surprise that what they are pleased to consider the greatest Geographical Society in the world should be housed in so mean a building. Our library grows at such a rate that it overflows into every room and landing in the house. For our enormous collection of maps it is only by the greatest ingenuity that we are able to find space, while the difficulty in getting access to them is daily becoming greater. Our rapidly increasing collection of photographs is becoming embarrassing. The work of our draughtsman and of our instructor all suffer for want of space. We are constantly obliged to decline offers of valuable objects of great interest, which would go a long way to furnish an instructive museum, because we have no place to put them.

At the conclusion of our educational exhibition, some sixteen years ago, we formed a small educational collection for the convenience of those interested in that aspect of our subject. But, as we could only house it in an attic, we were compelled to hand it over as a loan to the Teachers' Guild. The want of a suitable hall of our own hampers our work in many ways. Our meetings, under present conditions, are almost necessarily confined to those which are held about once a fortnight during the session, and which, of course, are an important feature in the Society's work. We have occasional afternoon meetings in the map-room, for papers dealing with the more technical aspects of our subject; but these, for obvious reasons, are necessarily restricted. Yet there is ample scope, with so many eager young geographers working at various branches of our science, for an increase in such meetings. Not only so, but we might have occasional short courses of lectures on one aspect or another of our many-sided subject, which I am sure would be appreciated by a large number of our Fellows as well as by others.

Geography, in this country, is not only expanding on the scientific side; its importance in connection with various human activities in several directions—commercial, industrial, colonial, political—is becoming more and more felt. Our Society cannot ignore this aspect of the question, which it is our obvious duty to solve.

Our library and map-collection are capable of considerable expansion, if only space admitted of it.

I feel it to be my duty, without insisting further on the many advantages which would accrue to the Fellows from a new and much enlarged building, to bring the subject before the Fellows of the Society at the present time. For the last ten years, without by any means neglecting other work, we have been more or less absorbed in our efforts to equip a national expedition for the exploration of the one great unknown region on the face of the earth. Our efforts, so far as the equipment and despatch of the expedition is concerned, have been crowned with success. I think it right, therefore, to prepare you for what is bound to come next; and I feel confident that the Fellows will have sufficient pride in their Society, and sufficient ambition that it should continue to maintain the great position which it has held in the empire and the world, to support the Council when it resolves to adopt measures for the erection of a building worthy of the Royal Geographical Society.

NOTES ON A MAP OF "THE GLACIERS OF KANGCHENJUNGA," WITH REMARKS ON SOME OF THE PHYSICAL FEATURES OF THE DISTRICT.*

By Prof. E. J. GARWOOD, M.A., F.G.S.

THE accompanying map has been constructed from a rough plane-table survey made during my journey round Kangchenjunga with Mr. Freshfield in 1899. In this I adopted as a basis over thirty fixed points determined by the officers of the Survey and laid down in the trans-frontier map on the scale of 2 miles to the inch.*

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* Partly read at the Royal Geographical Society, December 9, 1901, as supplementary to Mr. Freshfield's paper. Map, p. 136.

This official map, which is confined to the Sikhim side of the main chain, though sufficiently accurate in its chief features, does not profess to delineate the details of the Kangchenjunga massif, neither (except by marking the Zemu glacier as "moraine") does it take cognizance of the numerous glacier systems which drain the central portion of the range. The native name Kangchenjunga, meaning literally "the five treasuries of greatest snow," given by the inhabitants of Sikhim to the four loftiest summits in which the range culminates, probably refers to the roof-like character of the peaks, and does not necessarily argue any early knowledge of the chief glacier system; the word translated "storehouse" being said to mean primarily the little barns with high-pitched roofs in which the natives store their crops.

My plane-table survey consisted chiefly of bearings to the chief ridges, valleys, and glaciers, the details of these being subsequently filled in during the final construction of the map.

The material used for this purpose was obtained as follows: From each plane-table station a round of photographs was taken, in all upwards of a hundred photographs, from which much of the detail of the map has been derived by a method well known to cartographers as set forth in 'United States Coast and Geodetic Survey Report, 1897,' Appendix No. 10.

In addition to my own photographs, I have derived great assistance from the beautiful panoramic views taken by Signor Vittorio Sella for Mr. Freshfield during the expedition. The positions from which these were taken have been determined with considerable accuracy, the photographs used containing always three or more points already fixed on the map, the focal lengths of the lenses with which they were taken being also known.

Between the plane-table stations numerous observations were made with a prismatic compass, and a quantity of photographs were taken by Signor Sella and myself from positions which were also afterwards determined in a similar manner.

I am further much indebted to various notes and sketches made by Mr. Douglas Freshfield during our journey, and I should like here to acknowledge the great obligation I am under to Mr. Freshfield, not only for inviting me to accompany his expedition, but also for invaluable help and criticism throughout the construction of the map.

My thanks are also due to Mr. Reeves, the head of the map department of this Society, for much kind assistance, especially in the matter of calculating true heights from my aneroid determinations, and to Mr. Batchelor, who has assisted me throughout in the drafting of the map.

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* For details of maps bearing on the district, see Freshfield, *Journal*, vol. xix. p. 461.

Since our return I have consulted a copy of the native surveyor Rinsing's original map of the Nepal side of the watershed, and the recent information obtained by Messrs. White and Hoffman, and embodied in one of the small-scale survey-maps. Copies of these maps were kindly given me by Colonel Gore, the Director-General of the Indian Survey. A new edition of the route-map of Sikhim appeared in December, 1900, from which I have extracted further information with regard to the trend of the valleys immediately to the south and west of Lama Anden.

Rinsing's map, though fairly correct in its general bearings, was found to be too vague to afford much assistance in supplementing detail for our map, his strange habit of delineating glaciers as both originating and terminating in streams, a peculiarity emphasized in the newest editions of the small-scale Government maps, being often highly confusing.

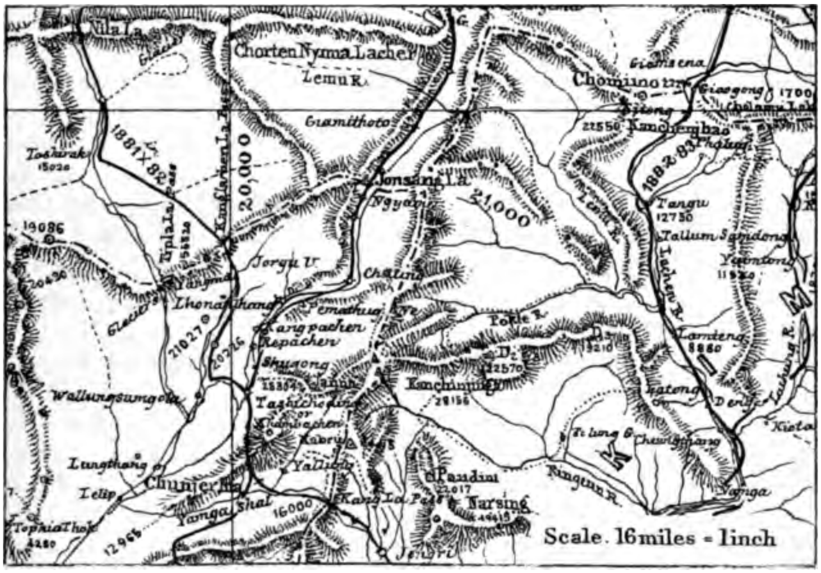

FIG. 1.—REPRODUCTION OF PART OF CHANDRA DAS'S MAP.

The only other map of this district that calls for mention is that accompanying Sarat Chandra Das's paper, "How I crossed the Jon-Tsang-La (*sic*) Pass," read before a meeting of the Buddhist Text Society of India at Darjeeling, in November, 1899, *after* the return of our expedition.* There can be no doubt that the pass actually crossed on this occasion was the Chatang La, as there stated; the name Jonsong La being added afterwards, on the supposition that the two names referred to the same pass. That this is not the case is perfectly evident from the account of his route after leaving Ramthang, which he describes as lying between two parallel ranges which, "after a time, changed from north to north-west," the ground traversed consisting of boulders and bogs; whereas the route from Ramthang to the Jonsong La runs at first due east and afterwards east-north-east, and lies entirely over the Kangchenjunga and Jonsong La glaciers and moraines. This confusion of two totally different valleys and passes and the omission of one, has an amusing effect on his map, for it leaves an isolated basin, marked as Chorten Naima Laichen, to drain which he has carried the source of the Zemu river from the east right through the two main watersheds, and brought himself out still to the west of the main north and south watershed instead of to the east (see Fig. 1).

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* This paper is an exact reprint of the writer's narrative of a journey to Tashilunpo in 1879, which appeared in 1881 as an official report, with the important addition of the name Jong Song La to the pass which, in his previous account, he calls the Chortang La.

The general differences between the present map and those published by the Indian Survey will be easily visible on comparison. It may, however, be well to indicate a few of the chief structural alterations adopted. In addition to the insertion of the main glaciers and *névés*, some sixty in number, as accurately as the material at my disposal would admit, the following are the principal alterations introduced on the Government map:—

1. In the basin drained by the Zemu Glacier I have inserted the main spurs which buttress the north-eastern wall of Kangchenjunga and the *névés* which lie between, and similarly the ridges and glaciers bounding the southern side of the Zemu Glacier from Si-imvovonchum to Lama Anden. These will, I think, be found to be delineated with sufficient accuracy. The same cannot, however, be said with regard to the north-west feeder of the Zemu and its tributaries, nor the glaciers which cling to the flanks of Lama Anden itself. The latter we did not visit, and only photographed it from afar off. The former we were prevented from exploring by the snowstorm of September 24, and I have only one photograph, taken by Mr. Hoffman, of the ice-fall at the point where it enters the trunk stream. My information is derived chiefly from Messrs. White and Hoffman's sketch, and Mr. Freshfield's notes made before the storm, and such observations as we were able to make on the direction of the watershed. Lastly, the summits of Si-imvovonchum, seen from the Zemu Glacier, have been removed from the main watershed, since bearings taken from the Thé La, the left bank of the Zemu Glacier, and from the ridges above Jongri, all indicate that the triangulated summit is not visible from the north, as formerly supposed.

2. An alteration in the position of the Thé La. This has been moved somewhat to the east as the result of a study of photographs taken both by Signor Sella and myself, from carefully ascertained positions in the

neighbourhood of the pass, and on both sides of it, the bearings from these including all the fixed peaks from Lama Anden to Kangchenjunga.

3. The watershed forming the head of the Langpo valley has been removed further west, though its exact position is uncertain, owing to the absence of any cross-bearings, and the minor ridges and glaciers of this basin have been drawn in from bearings taken on the spot. The pass visited by Mr. Freshfield at the head of the north branch of the Langpo Chu is not the Choten Nima La, as was stated by Rinsing at the time, but a gap situated some miles further east, not on the main Tibetan watershed between the Teesta and the Arun, but on a spur

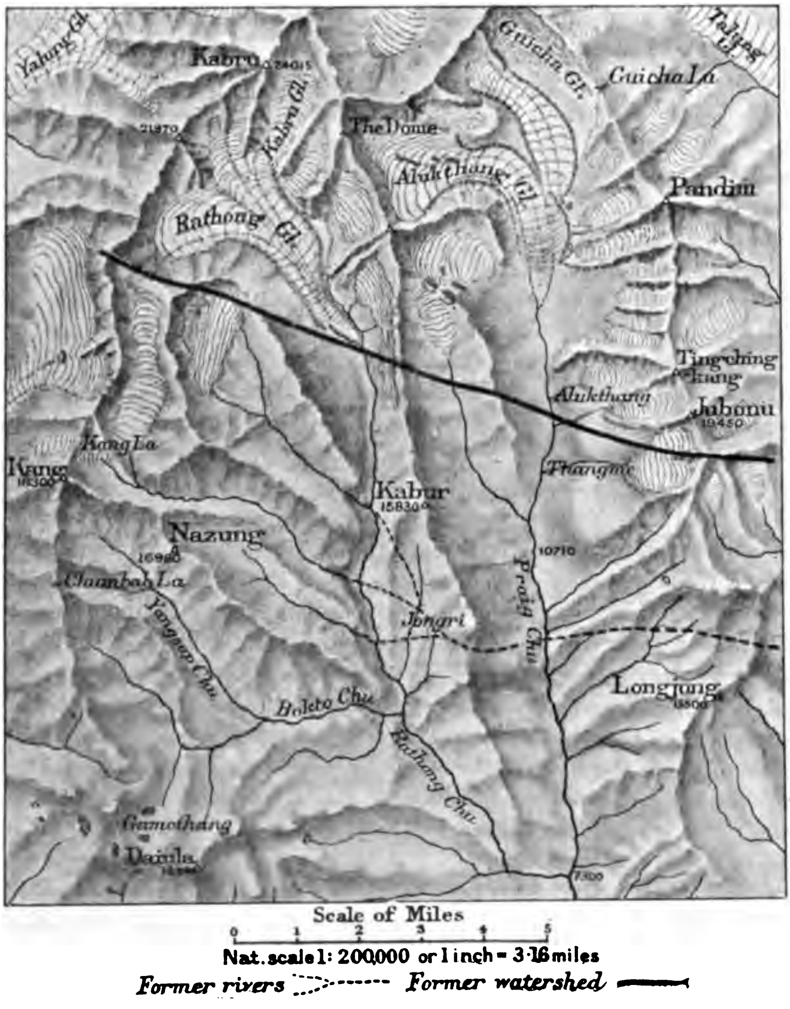

FIG. 2.—PRESENT AND PAST DRAINAGE SYSTEMS OF THE JONGRI DISTRICT.

separating the upper Langpo Chu from one of its more northerly tributaries. The general topographical features of the Lhonak district have also been considerably altered. Thus, I have mapped in the glacier at the head of the Tumrachen Chu, which I ascended for some distance. From this glacier I examined a gap in the watershed to the north-west, which appeared practicable for coolies, and which should lead directly to the upper basin of the Langpo Chu; by following this route, instead of crossing the Thé La, a day's march should be saved in traversing from the Zemu Glacier to the foot of the Jonsang La.

4. On the Nepal side most of the detailed information is laid down for the first time. Though made independently, my map agrees fairly well, as far as the general trend of the valley is concerned, with Rinsing's sketch-map of the district. Great difficulty was experienced at the time in obtaining bearings in the Kangbachen valley on account of fogs, and I found it no easy task after a day's march through clouds to identify the summits of the Jannu range from the opposite side. At Khunza I was cautioned by Mr. Freshfield against undertaking survey operations for fear of further rousing the suspicions of the natives, who, besides demanding our rifles, were reported by Rinsing to have sent down to the nearest garrison news of our arrival. Scarcity of food, also, for the coolies made it advisable to push on to Jongri without a halt. I have, therefore, only attempted a general delineation of the Jannu and Yalung Glaciers, the main features of the latter having been inserted from Rinsing's map and from photographs supplied by Major Waddell, taken from the Semo La. The Kang La is indicated where we crossed it, and is not to be confounded with the Kang La Nangma further north, which is not the practicable pass from the Yalung valley to Jongri, but a high glacier basin.

5. In the neighbourhood of Kabru and the Guicha La numerous glaciers were mapped in on the spot, and some slight alterations have been made in the watersheds shown in the survey maps. In this connection there is one identification of Major Waddell's which I should like to correct. The peak marked Kangtsen in the profile on p. 416 of his book * is not the 21,970-feet peak lying immediately to the south-west of Kabru, but another peak situated further to the south on the Kang La watershed. Both of these peaks and their relative positions are well seen in Plate IV. of Dr. A. Boeck's Himalayan Album.†

The details of the Talung Glacier and its *névé* have been inserted from photographs taken by Mr. Hoffman during his passage through the Yalung valley on his way over the Guicha La. For the valley below information has been obtained from a skeleton map corrected in 1894 and 1900, to which Mr. White, the political officer in Sikhim, is said to have been a contributor. Outside our line of route the Government map has been followed, the authority for such alterations as have been inserted being derived from distant photographs, or, in the case of heads of the glens under Si-imvovonchum and Siniolchum, from sketches made by Mr. Freshfield from above Gantok. These portions of the map are obviously mere sketches, with no pretension to be more than rough indications of the extent of the snow and glaciers, and it is much to be regretted that neither from Mr. White nor from any other quarter have we been able to obtain more detailed information.

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* Dr. A. Boeck.

† 'Travels in the Sikhim Himalayas.'

Heights.—The heights for which I am responsible, given on the map, were taken in most cases with a Watkin aneroid barometer. This was constructed in two portions, a high instrument registering from the sea-level to 15,000 feet, and a low instrument registering from 15,000 feet to 30,000 feet. These were tested against a portable mountain barometer, kindly lent me by the Director of the Meteorological Office, to a height of 16,000 feet, and found to work perfectly. They were also kindly tested for me on my return by Colonel Watkin himself, under the conditions under which they were used, viz. by destroying the vacuum between each change of pressure, and taking a reading one minute after the instrument had been put into action. In addition to the readings of the observatory barometer at Darjiling, I have a series of observations kindly taken for me with a portable barometer, which I left with him for the purpose, by a father of St. Joseph's College, and a further series from Gantok, which Captain Le Mesurier arranged should be taken for me twice a day at stated hours.

An observation taken by Signor E. Sella with a short mercurial barometer, also calculated with Calcutta as a lower station, gives the Jonsong La the height of 20,340 feet. This remarkable correspondence with the observation taken with the Watkin aneroid used during our journey is a strong confirmation of the other results obtained with the same instrument, as well as of the value of the Watkin aneroid in the determination of heights.

With regard to nomenclature, a peak without a name is a difficult one to locate or to describe; I have, therefore, inserted several English names suggested for this purpose by Mr. Freshfield or myself; unfortunately, the Tibetian equivalents of these with which Mr. Earle, the late Assistant-Commissioner at Darjeeling, has kindly furnished me, have arrived too late for insertion, but will, I hope, be adopted in lieu of our English names by future cartographers; they are—

Cloud-gap = Tinseb.
The Pyramid = Hoong-Khoong.
The Tent peak = Guryibri.
The Dome = Bāgam.
The Twins = Ishemah.
The Bridesmaid = Pag-yok-ma.
Furrowed peak = Tokpori.
Limestone range = Dokarrigû.

The following table shows the readings corrected and the heights determined:—

HEIGHTS CALCULATED FROM OBSERVATIONS TAKEN WITH WATKIN ANEROID, No. 22.

Date.		Corrected aneroid reading.	Barometer at Darjeeling (7300 feet above sea-level).	Observed temperature.	Darjeeling mean temperature.	Height above sea-level.
Sept. 19	Camp in Poki Chu valley	19·80	23·000	50°	60·0°	11,471
,, 20	Edelweiss first found	19·60	23·000	50	60 0	11,752
,, 20	First camp, Zemu glacier	18·03	22·929	40	61·4	13,910
,, 21	Second camp, Zemu glacier	17·93	23·011	45	62·6	14,208
,, 22	,, ,, ,, ...	17·93	23·003	45	60 6	14,179
,, 23	Third camp, Zemu glacier	17·31	22·989	45	62·4	15,139
,, 24	,, ,, ,, ...	17·13	22·937	40	58·6	15,299
,, 27	Second camp, Zemu glacier	17·93	23·079	45	59·9	14,270
,, 28	Jak camp, south side Thangchung La	18·03	23 092	45	60 0	14,101
,, 29	Top of Thangchung La	16·61	23·087	40	60·1	16,333
,, 29	Camp in Tumrachen valley	18·03	23·087	50	60·1	14,204
,, 30	Top of moraine, Tumrachen glacier	17·00	23·083	45	59·9	15,736
,, 30	Camp south side of Thé La ...	17·43	23·083	40	59·9	15,011
Oct. 1	Top of Thé La	16·36	23·097	40	59·1	16,752
,, 1	Lhonak 1st camp	17·85	23·097	50	59·1	14,444
,, 2	,, 2nd camp	16·84	22·971	45	58·1	15,846
,, 3	,, 3rd camp	16·64	23·055	45	59·4	16,290
,, 4	Camp moraine north side Jonsong La	15·94	23·133	40	60·6	17,519
,, 5	Camp rocks foot of Jonsong La, north side	15·16	23·069	35	60·1	18,749
,, 6	Top of Jonsong La	14·34	23·075	32	58·9	20,207
	Calculated from Calcutta	—	—	—	—	20,348
,, 6	Camp below Jonsong La, south side	14·58	23·075	32	58·9	19,767
,, 7	Second Camp, Jonsong La, south side	15·46	23·103	40	58·3	18,290
,, 8	Camp corner Kangchen valley ...	16·09	23·154	40	58·1	17,260
,, 9	Camp in dried moraine lake, Kangchen valley	17·13	23·135	40	58·1	15,531
,, 10	Ramthang	17·22	23·137	45	57·6	15,431
,, 10	Camp Kangbachen	18·00	23·137	40	57·6	14,177
,, 11	End of Jannu glacier	18·21	23·135	45	58·0	13,895
,, 13	Top of Mirgen La	17·53	23·139	35	56·4	14,858
,, 13	,, next pass	17·23	23·139	40	56 4	15,361
,, 15	Top of Kang La	16·60	23·139	32	58·1	16,313

I have entered somewhat into detail in these notes on the construction of the map, not so much to excuse myself for the many shortcomings in the topography, for I am not unmindful of the proverb, "qui s'excuse s'accuse," but in order that those who follow in our footsteps, be they climbers or surveyors, may know which portions of the map they may treat with some degree of confidence while choosing a route, and which they should regard with a prudent scepticism in all matters of detail.

SOME PHYSICAL FEATURES.

A detailed account of geological structure would serve no useful purpose here, as I hope shortly to describe the district from this point of view in another place, but a few remarks on some of the more striking physical features met with during our tour may not be without interest.

The Denudation Curves.—In the forest belt up to about 10,000 feet these show a remarkable divergence from the typical logarithmic curve so characteristic of water denudation; this concave curve being replaced by a marked convex curve produced by the thick growth of vegetation. As we ascend above 10,000 feet this curve gradually becomes replaced by the normal concave curve, until above 12,000 feet the usual features are dominant.*

When traversing the Sikhim ridges this moel-shaped outline constantly presented itself. That it is due to protection by the dense covering of vegetation is shown by hills like that on which Darjiling is situated. Here on the clearings for tea plantations the original soil is liable to be carried away, and the usual concave curves are rapidly produced. I had an admirable opportunity of studying this phenomenon when, on our return to Darjiling, we traversed the portion of country visited by the great storm of September 24. Many of these gullies showed that the soil and subsoil had collected to a depth of 15 to 20 feet under the protection of the dense primeval forests, and it was in consequence of the lubrication of the rock surfaces beneath this incoherent accumulation that the fatal landslips of that date occurred.

Lakes.—The absence of lakes in other portions of the Himalayan range is a feature which has been commented on by many explorers, and the district we visited formed no exception to this rule. The few tarns we encountered were all situated in morainic hollows, the water being held up either between two moraines or between a moraine and the valley side. What are left of these are insignificant pools, but two much larger sheets of water must once have occupied similar hollows, one in the Langpo valley and the other on the site on which Khunza now stands. The latter, which was dammed by the old lateral moraine from the Jannu Glacier, after the Kangchenjunga Glaciers had begun to retreat, must have been at least a mile long. This entire absence of rock-basins from valleys formerly filled by ice is not without bearing on the supposed origin of lakes by glacial erosion in other alpine districts.

Hanging Valleys.—This is a name suggested by the eminent American geologist Gilbert for the discordant side valleys whose drainage enters the trunk stream at a higher level than the floor of the main valley. On several occasions the presence of these valleys was shown in a greater or less degree, but the district in which I had most leisure to study these interesting phenomena was Jongri, near the southern foot of Kabru. Here we have two main valleys, one carrying off the water of the Praig Chu draining the glaciers about the Guicha La pass, and the other Chakchurong Chu, which drains the western Kabru glacier. Standing on the heights above Jongri, and looking west to the Kang La range, I was struck by a conspicuous pair of large hanging valleys notched out of the eastern slope of the Chaokchurong valley (Fig. 2 and Plate, Fig. 1). The history of these valleys is full of interest, and appears to have been as follows:—

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* See Marr, "On the Origin of Moels," *Geographical Journal*, 1900.

After the final elevation of the Kangchenjunga range, the drainage on the Sikhim side of the watershed took place by rivers flowing to the east and east-south-east. Relics of this initial drainage, consequent on the uplift, are still found in the Poki Chu, the Langpo Chu, the Zemu Glacier, and the Talung Chu, and the intervening watersheds dividing them. The Talung Chu is bounded on the south by the range between Jubonu (19,450 feet) and Malong (14,500 feet), which was continued westward through the neighbourhood of the east peak of Kabru to the main watershed somewhere north of the Kang La and south of Kabru. To the south of this watershed other parallel ridges and valleys must once have existed, trending at right angles to the Singalela ridge. In like manner we have relics of the original drainage on the Nepal side of the range, where the valleys occupied by the Kangchenjunga and Jannu Glaciers, and the Yalung river form portions of the main consequent streams. The present radial arrangement of the glaciers, which, to some extent, obliterates the initial drainage, is due to the superior resistance of the Kangchenjunga massif, the direct result of which is to force the drainage of the upper glens inwards, and bend it uniformly towards this central dominating ridge. On the other hand, if we examine the country at the outer extremities of these original easterly flowing valleys, we find that its drainage is now determined by the headwaters of the rivers cutting back by the *shortest* routes from the plain level, and therefore having the steepest gradients. These are the rivers occupying the "subsequent" or "strike" valleys running parallel to the main north and south axis of elevation. Those which have established a most commanding lead are those situated furthest from the axis of upheaval where the original east and west ridges were least developed, and therefore most easily cut through. Examples of these are the Lachen, or Zemu.

At the present day, as we have seen, we still have traces of the original drainage on the east side of the range as far south as the Jubonu-Malong range, but to the south of this a different state of things exists. The original subsequent streams draining the southern flanks of the east and west ridges have cut their way back from the plains, capturing one by one the headwaters of the original consequent streams, as ridge after ridge was cut through by the steeper gradient streams. The last of these ridges cut through is the old Kabru-Jubonu-Malong ridge, which has been gradually destroyed by the erosive action of the Praig Chu and the Chakchurong Chu, the former of which is steadily approaching the Talung valley by the Guicha La, and the latter the Yalung by the gap to the south of Kabru, the north and south ridge on which Kabur stands being a new watershed produced in the process. If we now carry our minds back to a time anterior to the destruction of the Kang La range, and imagine a similar parallel ridge still further to the south running from the Kang peak by Nazung

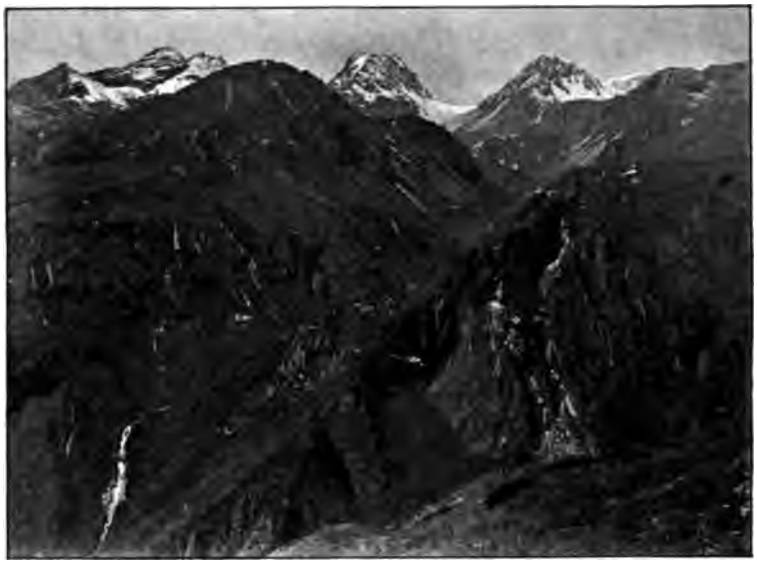

Fig. 1.

HANGING VALLEY AND WATERFALL OF KANG LA FROM ABOVE JONGRI.

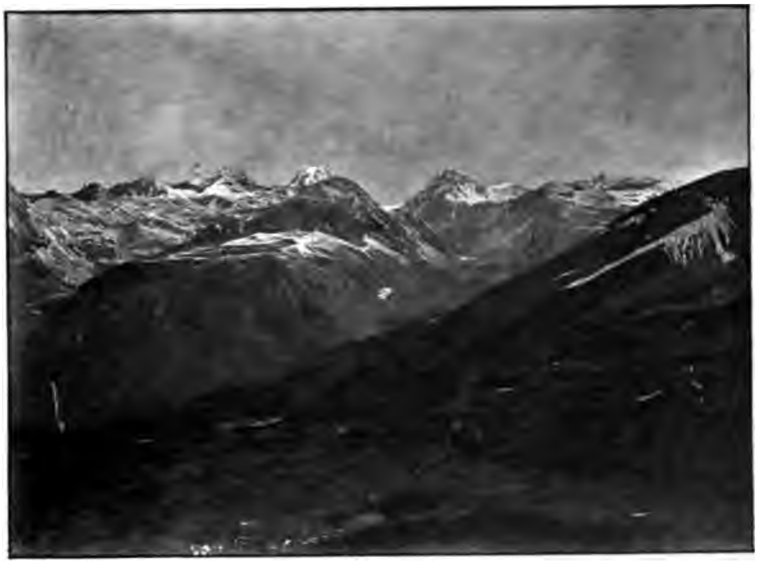

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Fig. 2.

DISTANT VIEW OF HANGING VALLEYS,
Showing the Jongri gap in Foreground.

to the south-east, we should then have between these another of the original consequent valleys south of, and running parallel to, the Talung Chu. That such a valley once existed follows, I think, from the general scheme of the drainage as described above, and accounts satisfactorily for the hanging valleys of the Kang La district, which therefore represent the truncated upper tributaries of this old consequent valley which trended to the south-east.

An interesting confirmation of this theory appears to be furnished by the Jongri plateau, which occupies a trough-like depression on the Kabur ridge between that peak and some lower elevations to the south. It is a unique feature in the district, and forms a rich grazing ground on which the Rajah of Sikhim maintains his herd of yak (see Plate, Fig. 2). I was much puzzled to account for this notch cut out of a comparatively narrow ridge and truncated at both sides by deep valleys. I think, however, that there can be little doubt that it represents a fragment of the old valley into which the hanging valleys of the Kang La once drained.

It now only remains to account for the more rapid deepening of the subsequent valleys by which the old headwaters of the consequent streams were converted into hanging valleys.

This I would attribute to two causes—in the first place, to the elevation of the north end of the district; and secondly, to the protection of the hanging valleys by ice. This elevation, which has taken place in other glaciated mountain regions, would be most marked where the ice was thickest, *i.e.* in the Kangchenjunga massif, lying due north of Jongri. As a direct consequence of this, the streams draining from north to south would have their velocity, and consequently their erosive power, increased, while those draining east and west would be merely tilted sideways, and would tend to widen rather than deepen their valleys. This supererosion by the subsequent streams probably took place during an interglacial period or periods, and when, after a further cold period, these glaciers retreated, they would linger longer in the high-level hanging valleys than in the deeper valleys below. This indeed is the state of things at the present day where ice still occupies and protects the upper portions of the hanging valleys, while the lower extremities are rapidly cut back into gorges by the water which escapes into the main valley. This superior erosive power of water over ice is noticeable in the other valleys; thus, the glacier at the upper end of the Chakchurong gorge rests on a raised platform, which the ice has obviously protected from the action of the river which replaces it lower down.

In conclusion, then, I would attribute the hanging valleys of Jongri to the erosive action of the "subsequent" north and south streams, which on account of their greater declivity have cut through the watersheds of the original easterly flowing "consequent" streams and captured their headwaters. The final differences in level between the trunk stream and its new tributaries have been produced by the elevation of the upper end of the trunk stream (probably in interglacial times), assisted by the protection afforded to the tributary valleys by ice.

KIKUYU: NOTES ON THE COUNTRY, PEOPLE, FAUNA, AND FLORA.

By Major RICHARD CRAWSHAY.

THE East Africa Protectorate has not been more fortunate in orthography as regards districts, tribes, and places than Uganda. If you would speak of Kikuyu to people other than natives of the Protectorate, to make yourself intelligible you would have to say the "Kenya district;" if of the headquarters of the district, "Kikuyu;" if of the mighty snow-peaked Kilinyatha, "Kenya" or "Kinya," its Ikamba name, yet even so not quite correct, as the Akamba call it Ke-Nyaa. Mistakes such as these are innumerable. I have no desire to share in perpetuating errors. I propose, therefore, to adopt in this paper only such names as are in use amongst the natives themselves, as far as I have been able to ascertain them.

First I must explain that Kikuyu is the country of the Akikuyu, that is, the belt of primæval highlands in the north-west of the Protectorate, including mountains such as Kilinyatha, 18,600 feet,* and Kiinandarwa, 14,000 feet. It lies practically on the equator, between the parallels of lat. 0° 0′ and 1° 45′ S., and long. 36° 30′ and 37° 45′ E. Its altitude ranges between 4500 feet and 18,600 feet, the height of Kilinyatha. Its climate varies between the extremes of moderate summer heat in Northern Europe and the cold of perpetual snow.

In the 330 miles' march from the sea-coast to Kikuyu, now happily compassed by the Uganda railway in twenty-four hours, various phases of country are apparent to the traveller. First there is the hot steamy coast belt of scrubby bush, thorn, and aloe, 150 miles broad, the major portion a desert, except when awakened to life by the seasonal rains. Then comes the dry park-like mimosa country, extending from a little north-west of Kibwezi to Kilimakiu. Thirdly, there are the open plains of the Masai country. Lastly, the cool dark forests of Kikuyu. All these changes are welcome in their turn to the traveller.

From the suffocating heat of the desert bush, where he cannot see more than a few feet in any direction—where, should he leave the path, his clothes will be torn off him, or he will impale himself on the terrible aloes or lose himself to die of thirst—he emerges into the mimosa park, uttering the heartfelt cry, "Thank Heaven, all East Africa is not like *that!*" He hopes for better country still, and he will not be disappointed. As the prospect opens up before him of the boundless grassy plains of Masai, and the myriads of antelope, zebra, ostriches, with an occasional rhinoceros, grazing at will as far as the eye can see, he fills his lungs with the invigorating air, and exclaims aloud, "Ah, *this* is a country after my own heart!" Still, nothing is more tedious than plodding on foot over vast stretches of prairie, where progress is so slow as to appear almost *nil*. The traveller is glad when, after crossing the Athi river, he finds himself on the water-parting line between it and the Nairobi river, with the Kikuyu escarpment rising in full view from the plains at his feet.

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* Captain Smith and Mr. Mackinder both estimate the height at about 17,200 feet.

I shall never forget my first view of Kikuyu from here, when, after lingering until past noon beyond the Athi river to shoot a water-buck, and covering the intervening distance during the fierce heat of the early afternoon without having eaten or drunk anything since before sunrise, I and my three native companions arrived on the ridge a little before sunset, and sank down weary and footsore to rest ourselves, feasting our eyes on the glorious prospect which opens up suddenly at this point for the first time. In front for 8 or 10 miles is a waving sea of grassland, falling away gradually to the Nairobi, and from it rises the dark-green Kikuyu escarpment, innumerable thin columns of smoke showing this to be inhabited by man. Standing sentry over all, as it were, are the blue-grey ridges of Kiinandarwa and Kilinyatha, 80 and 120 miles away. There is to the eastward the vast expanse of rolling prairie which divides Ikamba and Kikuyu, green, yellow, or black, according to the time of year, bare and treeless, except for a few dwarf mimosas marking the course of the Athi river. Nothing in the shape of a hill breaks the horizon, except the solitary roach-backed Kianjahi, about midway between Ikamba and Kikuyu. The land gradually rises to the westward for about 6 miles, when it meets the south-western spur of Kikuyu, green and timbered, from behind which stands out the four-peaked Kiambiruiru, the base of which is inhabited by Masai. There is open grassland to the southward, undulating and stony in places, with rocky-topped hills cropping up picturesquely here and there, and the Kiketi mountains of Ikamba in the distant background.

The ascent into Kikuyu is as delightful and exhilarating as the distant prospect has led one to expect. The two countries are distinct worlds—not only physically, but in climate, and in their faunas and floras. It does not require an expert to remark this at every turn in the 8 miles' walk to Fort Smith, barely 1000 feet above the plains. Leaving the Nairobi river, the road at once plunges into tall dark forests; then ascends, through park-like country, clothed with waving grass waist-high, a mass of flowers and flowering shrubs; then, about 4 miles out, through native plantations, with here and there the mushroom-like grass-roofed huts of the natives, dotted about in clusters on the open spurs, surrounded by formidable Sodom apple, or nestling in the few remaining clumps of primæval forest. There are no villages on the very outskirts of Kikuyu, as the natives prefer to have a certain distance between themselves and the thieving Masai, men of the open plains, who therefore dread the forest.

Fort Smith, or Kabeti—its Kikuyu name—is situated at about 6400 feet, on the shelving spur of a ridge stretching approximately north by east and south by west. The surrounding country is open and under cultivation for miles and miles, with the exception of occasional groves of trees, or tracts of waste land, originally forest, then cleared for cultivation, afterwards allowed to run fallow, and now thickly overgrown with dwarf Sodom apple and bracken.

The flats and slopes are green with the rich dark foliage of the sweet potato (ngwachi), the staple food of the natives of these parts. According to the time of year other crops are grown: beans of four kinds—mboasho (a French bean), njahi (a bean growing in pyramid-like clusters), thorokko (a tiny ground bean), njuggu (the tree bean with a yellow flower); bulrush millet (mweri); foxtail millet (mukombi); dwarf rush-like millet (mugimbi); sorghum (muhya); and maize (bembi). The land in the rich alluvial bottoms is usually reserved for sugar-cane (igwa), and a kind of edible arum (nduma).

It is in the cultivation of the yam (kikwa) that the Akikuyu as a tribe excel, but round Fort Smith, and generally at the lower altitudes, it is only grown to a small extent—here and there an irregular patch. In Kegiyo, between the headwaters of the Chanya and Thika rivers, the yam plantations are a sight, like nothing else I have seen elsewhere in native agriculture. There hundreds and hundreds of acres are to be seen in a highly flourishing state, planted in symmetrical rows like hops, the rows as a rule corresponding with the contour of the ground. The yam, of course, needs support. In Kikuyu, it is grown on a living tree, especially planted for the purpose. The mukunguku, as it is called, resembles the ash in bark and leaf. It is so hardy that the yam does not kill its growth.

There are two rainy seasons in the year. The first, commencing early in March, and lasting until the end of May, is known as mbura wa bembi, or "maize rains." The second, commencing about the middle of October, and lasting until the middle or end of December, is known as Mbura wa mweri, or "millet rains." In speaking of the calendar year, the Akikuyu would say "two years," as would other Bantu under similar conditions. Properly rendered, Mwaka is a season, *not* a year.

During the dry seasons there are dense mists and drizzling rains. This may be said to apply to all Kikuyu, with the exception of the heights of Kilinyatha and Kiinandarwa, where from 10,000 feet upwards there is probably no dry season at all. No general description of Kikuyu as a *whole* will do it justice, but certain characteristics are common. Hitherto southern Kikuyu alone, and of this only the southernmost corner on the borders of Masai, has come in for official attention. It is neither as rich nor as well watered as the northern and north-eastern portion, nor are the natives of as fine a type. Yet the poorest part of this rich country is *rich* in comparison with Masai and Ikamba.

The chief physical characteristics of Kikuyu are—

(1) An escarpment generally of gradual ascent, formed of corrugations, resembling those of a pudding-mould, rising parallel with one another and with the gradient of ascent, with steep slopes forming deep valleys between the corrugations.

(2) An abundance of streams of clear cold water, having their sources in springs and swamps in the highlands, flowing generally to the south-east, increasing in number and volume to the north and north-eastward.

(3) Soil of the richest loam, often nearly as stiff as clay, ranging in colour from terra-cotta to the brightest brick-red, except in the alluvial bottoms, where it is generally of a blackish-brown, mostly without stone or rock, and of great depth.

(4) Forest belts commencing at the foot of the escarpment, and—up to 10,000 feet or more—alternating with most beautiful stretches of natural pasture-land, where the grass grows as short and green as on rich common-land in Great Britain, and where white and pink trefoils are indigenous and flower all the year through.

(5) A climate with slight variations of temperature, nowhere attaining extreme heat or severe cold, unless in the regions of perpetual hail and snow on Kilinyatha.

(6) An abundant and usually constant rainfall.

(7) A unique though as yet limited fauna.

(8) A novel flora for tropical Africa, resembling rather that of Europe.

(9) An absence of animal pests noxious to man at the higher altitudes, such as venomous snakes, scorpions, centipedes, and white ants, with the exception of red marauding ants, which in the neighbourhood of streams or moist ground are as ubiquitous as they are vicious in attacking camps.

(10) An absence of malaria at altitudes ranging above 7000 feet, as far as my experience goes.

(11) A race of inhabitants of splendid physique, of a high order of intelligence, agricultural and pastoral in their habits, industrious, pugnacious amongst themselves, suspicious of and disposed to be hostile to all strangers; like the Zulu group of Bantu, quick to defend the honour of their women, but showing an open manly disposition to those who deal fairly with them and gain their confidence and friendship by tact and forbearance.

I think Kikuyu offers great possibilities to any one not afraid of isolation, and fond of a quiet country life amongst wild natives capable of almost any development if judiciously handled from the outset.

Quite the pleasantest time I have spent during some seventeen years' travel and residence in tropical Africa has been in Kikuyu, partly in residence at Fort Smith and at Roromo, partly on journeys to the north-east into Kegiyo and Katanga, and into Maranga on the south-west slopes of Kilinyatha.

Mr. Ravenstein is of opinion, I think, that no healthy country exists within the limits of tropical Africa, *even at extreme altitudes.* Practical experiment has yet to prove whether an exception has not to be made in the case of Kikuyu. People with experience of tropical Africa—especially the West Coast and the Central Africa Protectorate—will be generally of opinion that nowhere in these regions can there be found a country in which it is possible for the European to live, work, and enjoy life. Until I visited the highlands of East Africa I held this opinion, forced on me by Central Africa and the lowlying enervating East Coast. But after residing in Kikuyu and giving that country a fair trial, I found life there possible in all needful comfort and health, even when performing all kinds of manual labour in the open, and undergoing the hardships incidental to rough life under canvas and on the march.

Life passed quietly enough at Fort Smith, yet not unpleasantly. My time was occupied with official duties, gardening, natural history collecting, francolin-shooting, and in adding to my vocabulary of the language. Yet, living in a tent in a climate at all times cool and moist, often positively raw, what with rain, mist, and heavy dews, the weather proved a severe ordeal. Had it not been for the healthiness of the place, one's constitution must have suffered. There always seemed a *homely* atmosphere about Fort Smith, which I had never experienced anywhere else in tropical Africa.

Look in any direction you would, you could see African native life at home—that happy, sleepy, contented, go-as-you-please life so dear to the native in time of peace. In the Sodom apple tracts, or in the remaining patches of forest, were villages averaging five or six huts and their toy-house-like granaries with tiny conical roofs. Herds of cattle and flocks of fat-tailed brown-and-white sheep and goats were to be seen grazing on the pasture-land or the remains of the crops, or wending their way to or from water in the valley below.

A curious characteristic of the people is their fondness for fire, not only in the houses, but in the plantations or in the open on the hill-tops. All over the country for miles round are to be seen their blue columns of smoke, marking the whereabouts of some old men gathered together on the reception ground outside a village to pass the time of day, or a group of women and children resting in a plantation, or a small boy herding live stock on the open waste land. Fires such as these, as a rule, serve no other purpose than the companionship of their smoke; they are not used for cooking; they afford no warmth. If you ask the natives their object, nine times out of ten their answer will be: "Ni mwaki wa manna." ("It is a fire for nothing.")

In time of peace the Akikuyu lead a very happy life, devoted to their villages, plantations, and live stock. If you visit their villages in the early mornings between daybreak and sunrise, you will rarely find any one stirring. The gateways are barred, the doors of the houses have not been opened; all is still and silent within, except for the bleating of a sheep, or maybe some one coughing or talking. In most parts of tropical Africa at this hour the natives are all agog, and with the advent of broad day are on the way to their plantations or on their journeys.

Life and work with the Akikuyu commence after sunrise, often not until an hour after. The day begins with some sort of a meal, not on an empty stomach, as is the case among most of the tribes of Central Africa. The men then start off on their day's mission—it may be to make some distant purchase, or to settle a case, or to work in their plantations—generally accompanied by their women, and, when occasion requires, driving with them cattle, sheep, or goats.

I have travelled and resided for long periods amongst many Central African tribes, but nowhere have I been so impressed by any one of them as by the Akikuyu—their solid physique, their independent spirit, and their open manly nature. In the first place, the Mukikuyu is endowed with a sturdy frame, stout muscular arms, thighs, and calves, a deep broad chest, a thick neck, a broad forehead, and a square-cut open countenance. He gives you the impression that he is a man. He meets you like a man, without that cringing servility so generally affected by the tribes of Central Africa.

He does not mask his manly proportions by the petticoat-like dress usually worn by the latter, especially by the effete Arab-Swahili element. All he wears is a plentiful coat of terra-cotta earth (therega) and grease, supplemented by an extraordinary profusion of metal ornaments.

His weapons are in keeping. A stout, broad, ace-of-spades-shaped spear (itimmu), with a massive shaft tipped with iron; an oval buffalo-hide shield (ngau); a heavy double-edged short sword (luhyu), worn on the right side in a leather scabbard hung from a broad quilted leather belt, covering and protecting the more tender parts of the abdomen; a club (njuguma) and some stout sticks, such as would have delighted Burton.

His ornaments are so many and complex that it is difficult to do justice to them on paper. Into the hair of the scalp-lock is plaited a feather bonnet (mutowi), made from the first primaries of the guineafowl, or some other stiff-plumaged bird. It lies loose along the crown of the head, and droops somewhat behind, tossing jauntily as the wearer walks or runs. On the brow is the munyiro, a broad band of pendant chains of delicate workmanship, made of iron, copper, and brass in equal proportions, brightly polished. In the lobes of the ears are inserted ndebbi, flat discs of buffalo-horn or dark-coloured wood, about 2 or 2½ inches in diameter. Four little holes are also bored in the upper edge of the ears to receive a corresponding number of pencil-like sticks (nyoli) of some light wood, about 3 inches in length. Laced together on the *inside* of the wall of the ear to keep them from dropping out, these impart a gentle flapping motion to the ears as the wearer walks. Around the neck is worn the murumbo, a collar of finely twisted iron, copper, or brass wire, with a pendant tongue in front fitting into a keeper on the other end. From this collar in front depend a number of finely worked chains (ilengeli), such as those attached to the munyiro, but longer, reaching below the chest. Above the murumbo, or worn *without* it, is a prettily worked bead collar (kinyata), fastening at the back of the neck. Elderly men wear round the neck one or more talismans (ithito), contained in rams' horns; also a snuff-box (kinya) of ivory or wood. Young or middle-aged men wear coils of brass, iron, or copper wire, brightly polished, on their arms, above or below the biceps, sometimes both, and on their forearms as well. Brass is the favourite metal. A man of any particular standing usually wears the gethiyi, a square-cut skin "poncho," made for choice from the skins of the dendrohyrax (kikammi), sewn together symmetrically with the white tufts marking the dorsal glands in line. Another favourite skin is that of a monkey commonly met with in Kikuyu — *Cercopithecus albigularis* (gimma). In dry weather the gethiyi is worn with the fur outwards; in the wet, reversed, when the well-greased pelt readily throws off the rain. Round the loins, *below* the broad quilted belt of the luhyu, the munyoro is worn, another handsome chain belt similar to the munyiro, but narrow at the sides, and longer in front and behind, so as to cover the genital organs and the buttocks, without, however, concealing these. Like the Masai, the Akikuyu wear over the buttocks the kitheri, a piece of stiff, untanned sheepskin or goatskin, shaped like a heart with the thick end cut off flat, and the point depending. Beautifully made garters (mithanga) of fine-drawn iron, brass, and copper wire are worn below the knee, generally on one leg, occasionally on both. Anklets (malukku) made from the long, silky, black-and-white fur of the colobus (guyu), trail behind, like the deerskin leggings of the Red Indian. It is a recognized custom for a wealthy man (mundu mutongu) to wear a ring (ngomi) as his insignia of wealth. This is of iron, and has on it an oval shield some 4 inches long, covering the back of the finger and extending up the back of the hand. It would have been thought that the sight of ngomi would cause jealousy and expose the possessor to the risk of losing his wealth at the hands of others not so well off. However, I am informed this is not so.

Female dress is more ample, in skins, at any rate. Over the back, enveloping the person from the neck to the knees, is worn the nguo, a large oval-shaped mantle of sewn sheep or goatskins, rudely tanned and divested of their hair, and ornamented on the hem with beads. Another skin garment encircles the loins. If the owner is in a normally prosperous condition, she herself and everything on her are dripping red with therega and oil. Many of the ornaments are similar to those of the men; for instance, the munyiro over the forehead, ndebbi and nyoli in the ears, murumbo and kinyata round the neck, munyoro round the loins, and coils of brass, iron, or copper wire on the arms. In place of the muthanga below the knee, they wear several coils of brass or iron wire, put on so tightly as to interfere considerably with their locomotion. In addition to the munyoro, they wear very prettily made waist-belts of leather worked with kauri shells and beads. Young women wear on one ankle a huge bunch of iron rings, each about two inches in diameter. As in so many other respects, the exact converse applies to male and female dress in Africa as compared with Europe; feathers and furs, in such especial request with the ladies of Europe, are martial emblems in Africa. Mitowi and malukku are not worn by the ladies of Kikuyu.

No hideous tattoo marks disfigure the bright intelligent faces of these people of either sex. The only mutilation they undergo—apart from that of their genital organs—is the curious practice with males of extracting the two centre incisor teeth from the lower jaw. This they do, I am told, to enable water to be more readily poured into the mouths of the dead, as is the custom.

Primarily the Akikuyu are a pastoral people; for, though great agriculturists, they attach greater consideration to their live stock. Indeed, these are an object of greater solicitude with them than their fellow-men. If hostilities are under way, the first aim of the belligerents is to capture live stock, after that food-supplies. No thought is given to the capture of women and children, which with many Central African tribes is their first charge. Live stock almost invariably constitute the cause of all trouble, and certainly the prevailing themes for conversation or complaint. It amounts to this, then, that in a thickly populated country like Kikuyu, where the people acknowledge no paramount chief, but live, subject only to their heads of families, in numerous little villages of five or six huts, scattered about in close proximity to one another—village to village, live stock to live stock, plantation to plantation—might is apt to become right with those who are in a position to exercise it, the stronger at the expense of the weaker. As often as not, the trouble is some trifling excess, such as the looting of a single sheep by one who has many hundreds, or the infraction of a plantation boundary in a country where there is more than enough room for all, or some petty case of live stock trespass. There exists the usual complex Bantu law code, whereby the transgressor by a hair's breadth is liable to some penalty or other. If he is amenable, he will be saved further trouble. If he declines, as he is tolerably certain to do if he considers himself strong enough, there ensues a quarrel, the magnitude of which it is hard to foresee; for with the principals neighbours take sides, paid to do so, or prompted by the prospect of loot. Amongst themselves, the Akikuyu are a troubled sea, always in a state of unrest.

Agricultural implements are as primitive as the results achieved are creditable. If clearing a plantation in primæval forest, they commence operations by collecting quantities of dead wood, of which there is an extraordinary abundance, piling up this at the foot of the forest giants, and setting fire to it, keeping the fire burning for days, until either the base of the tree is charred throughout so that it falls straight away; or the tree dies as it stands, to fall, be burnt, and manure the ground with its potash a season or two later. For felling huge trees they have no heavy American axes, and if they had they would not be able to handle them. All they have is the ithanwa, a mere tomahawk of soft iron, for light work, such as cutting a Sodom apple bush, adzing a beehive, or shaping the timbers of a house. For clearing the undergrowth they use the luhyu as British soldiers use their bayonets on active service. For turning up the soil, they have no other implement than the munyaku, a pole of hard wood 7 or 8 feet long, with the point sharpened and hardened in the fire. Armed with minyaku, half a dozen men in line will turn over an acre of land in a surprisingly short time. Sun and fires, supplemented by the willing efforts of women wielding short stout crook-shaped clubs wherewith to break the sods, do the rest. For planting sweet potatoes, cuttings, yams, arums, bananas, sugar-cane, and the seeds of cereals or beans, they use the morru, a massive oval-headed knife—the morru of the men more heavy than that of the women. The attitude of the body in working with this implement is one of incessant stoop, resembling the gait of a monkey on all fours, as the right hand is employed in plying the morru while the left is used to plant, or weed, or aid in excavating, the back meantime parallel with the ground. In this position they will work for hours, moving forward from time to time without standing upright, and resting their arms on their hips when stopping work to speak to any one, or to look up at a passer-by. The heavier work is done by men; the lighter, such as planting, weeding, and harvesting, by women and children. It is a real pleasure to them to work in their plantations. There they remain all day, almost every day, singing lustily, so that their voices can be heard from hilltop to hilltop. At sunset or a little later they return to their villages, running home at the double, as if afraid of the darkness. In Kikuyu the sun is the very life and health of a man, bringing joy to his soul. It is not as in the lowlands of tropical Africa, where his mounting into the eastern sky is watched with dread, and his declining rays are noted with relief.

Primitive bee-keeping is a great institution. It is the source, also, of much *evil*, as the honey is used for brewing the highly intoxicating ndohi. Bees are not domesticated, or kept in hives in the villages as the property of individuals. All that is done is to utilize the wild bees, and facilitate the procuring of their honey. This is achieved by placing in suitable trees long hollow wooden cylinders (miatu), closed at both ends by discs of wood, in one of which a number of holes are bored, to give ingress and egress to the bees. Three or four miatu are sometimes placed in a big tree. Here and there in the forest they are to be seen, sometimes a day's journey from the village where their owner resides. In the plantations they are also placed at frequent intervals, usually in trees preserved for the purpose. The favourite tree for the purpose is a large species of fig, with sprawling limbs (mugummo). Many a fine tree owes its existence to the bees. The kihembi—the vessel used for collecting honey—is a wooden drum with a buffalo-hide lid, carried suspended by a strap round its centre, worn over the shoulder. The white and pink trefoils (ndawiwi)—the former of which grows at low altitudes, the latter not below 7500 feet—form a favourite food for the bees, and produce especially good honey.

Architecture, though primitive, is on a par with the people in solidity and practicality. The type of house, for an African one, is of unusually massive workmanship, built of genuine adzed planks (mihiligu), with a stout doorway capable of being heavily barred, an inner room of rectangular shape *within* the circular outer wall, and—most creditable of all—regular raised berth-like bedsteads (malirri), built of planks let into the wall. It requires no small labour in the first instance to make the massive round-edged mihiligu forming the outer wall, for these are of *solid* timber, about 5 feet long, 10 inches broad, and about 2½ inches thick, hewn out of the cedar-coloured wood of the mutarakwa, a Podocarpus. The plan of the house is roughly this: An outer wall about 4 feet high of mihiligu, firmly let into the ground, fitting closely together, the interstices caulked with moss. Inside this, an intervening circular passage about 4 feet wide, in which live stock are kept. Then an inner rectangular wall of logs and planks, in which are built the box-like berths about 4 feet from the ground, with a square opening in front to admit of the ingress of the occupant, and with a flooring composed of planks sloping downwards at a considerable angle from head to foot. In an ordinary hut there are usually two such malirri, one on the left-hand side of the inner doorway, which corresponds with the outer door, the other facing the door. Such a house as this would be occupied by a man and wife and small children, if any. In the inner chamber the inmates live. There it is usual to kindle a fire, and do what cooking there is. As a precaution against setting fire to the thatch, a barrier of logs is built overhead between the fireplace and the roof. It is a necessary, yet by no means always a successful, arrangement. Roaring fires are kept burning in the houses, and the sparks from the crackling logs are readily carried up round the barrier, and so into the thatch. If this is once set alight, it is all up with the house. If an ordinary man, the owner keeps his live stock in the outer passage, the cattle by themselves, the sheep and goats by themselves, with the adult male animals separate. If he is the head of a family and the possessor of large flocks and herds, these are housed in the Thingirra, a specially constructed house where a number of young men stay to protect them. The interior of these huts is so dark, in broad daylight, that nothing can be seen within unless by the light of the fire. "His house is his castle," may be fairly said of the Mukikuyu. *Cæteris paribus*, no one is likely to effect an entry by unlawful methods while the owner is at home.

Food is stored in granaries (makumbi), also in miatu piled up in the verandahs of the houses on either side of the door. The ikumbi is of wickerwork, of huge size, shaped like a snail-shell, with a hood-like opening in front. A single man can carry it empty to any place where it is required, and there set it up bodily on the platform of logs made to receive it. After it has been filled with grain, it is covered over with a movable grass roof of conical shape. The *vade mecum* of the Akikuyu is the kiondo, a closely woven cord basket, pottle-shaped, without a cover, made in all sizes, capable of containing from a handful of sweet potatoes to 100 lbs. of grain. It is worked in various patterns of black, brown, and yellow, and is wonderfully durable. A leathern strap sewn on at the sides enables it to be carried when full. If filled with grain, it is sewn up. For containing odds and ends, the men use the mondo, a flat wallet of stiff untanned cowhide, divested of hair, wide at the bottom, and narrowing towards the mouth. It is carried slung by a leathern thong over one shoulder. In the early mornings and late in the evenings in Kikuyu, I wore a scarlet yachting-cap. After I had been more than a year amongst these people, I was casually told they knew this as my mondo.

The Akikuyu carry loads, whether light or heavy, in the same way as the Akamba, viz. on their backs, suspended by a cowhide strap from the poll of the head; they cannot carry a load on their heads or on their shoulders, as do the coast tribes and those of Central Africa. For the baskets above described, the Kikuyu method of transport is well enough; when applied to the respectable baggage of Europeans, the result is disastrous in the extreme.

What I am about to say on laws and customs may well be prefaced with a few words of explanation as to how extremely difficult it is for a European to obtain reliable information from wild men on matters such as these. In the first place, the inquirer should have something more than a superficial knowledge of their language. The medium of an African interpreter speaking in another African tongue will not do, nor will the result achieved be any better if he speaks in "pigeon" English, as not only does he lack a sufficiently comprehensive vocabulary, but he is also tolerably certain to lack a sufficiently comprehensive and sympathetic mind to enable him to do justice to the people he represents. None but the language of a people is capable of doing them justice, more especially if they be wild men. Sir Harry Johnston has accurately gauged the difficulty a European has in approaching the African in his admirable article on "Anthropology" in 'Hints to Travellers.'

What is required is one who will himself be at pains to acquire the language of any wild men whom he is anxious to study, to do which he must be prepared to go and reside in their midst, and gain their confidence, which can only be arrived at by gradually disarming and dispelling their first impulses of suspicion, fear, and possibly downright hostility. Care must be taken to avoid offending their susceptibilities by errors of commission or omission; for instance, by ridiculing or ignoring recognized customs of the country, by manifesting repugnance to the people or their surroundings, by showing one's self unduly curious to pry into their affairs, or by too roughly over-riding those petty but exasperating obstacles which the African so delights to place in the European's way. If he can do all this, and, whilst quietly playing off his tormentors at their own game, observe outwardly an attitude of stolid indifference, though inwardly he may be consumed with impatience, he will succeed. He who exhibits the greatest amount of tact and forbearance, with the minimum of rough open coercion, will achieve the most substantial results; not he who, because he finds he has the power, will ride roughshod over every one and everything.

If you travel through Kikuyu from north to south and east to west, you will not see a single instance of deformity amongst the people, not as much as a deformed eye or hand or foot. Wild men in their wild and therefore natural state do not beget deformity; nor will the Akikuyu as long as they retain their spartan mode of life.

From the time a child (kana) is born—which may be in the plantation or on a journey—he knows no coddling, but is out all day long in the open, slung in a skin on his mother's back, whether she is working with the morru, or carrying a load, or gathering firewood in the forest. As a baby he is at first fed only on his mother's milk; later she supplements this with a calabash of gruel (ushurru), with which she appeases him when he waxes importunate at awkward times. In due course he is able to "go down"—in native parlance. He trots after his mother to and from the plantations, where he has got to know the sweet potato, and is now keen on digging these for himself with a pointed stick, and, better still, roasting them in the fire and eating them. In the village he has fine times, playing about in the dirt and on the rubbish-heaps with kindred spirits of his own age. As he grows into a kahe he becomes ambitious to have control of live stock. He is given this up to the hilt. All day long he is out on the hill-sides in the sun, wind, and rain stark-naked, or at most with no more clothing than a square of sheepskin caught up over the right shoulder and hanging under the left arm, worn over the chest or the back according to the exigencies of the weather. As a kihi, at about fifteen, he undergoes circumcision. He is then a mundu-murumi, who can marry as soon as he is able to pay a wife's dowry.

In the case of females, the successive stages from childhood are—Young girl (kiligu), when excision takes place, as with the Masai; maiden (muilitu), when she is marriageable; and married woman (mundumuka). In earlier and more prosperous times, the dowry paid for a wife used to be eighty sheep or goats, or cattle at the rate of one beast for twelve sheep. Latterly this has been too much for the impoverished state of the people, and fifty or even thirty sheep are the price. Dowry is paid to the father-in-law, who, on the birth of the first grandchild, usually restores to the son-in-law five sheep. But he does not always do this unless the son-in-law presses the point. If the wife proves barren, or leaves her husband on her own account, or proves false to him—which never occurs amongst the Akikuyu themselves—the dowry is returned to the son-in-law. Should famine or war supervene, and the husband be unable to maintain his wife, even this does not warrant her leaving him. It is for the husband to go to the father-in-law, who, according to his means, refunds a portion of the dowry, usually five or six sheep. Should he be too poor to do this, his alternative course is to go to a neighbour better off, and deposit his daughter with him until more prosperous times set in for her husband. When matters take this turn, the father goes to the neighbour, and if the daughter has been with him a month, presents him with a brew of ndohi; if two months, a drum of honey, in addition to the ndohi; if three months, a spear, in addition to the honey and the ndohi; if the daughter has been with the neighbour as long as six months, a sheep is given. Payment is not the idea so much as a small pledge by way of courtesy. When restoring the daughter to her husband, he also gives him a sheep. In civilization, so called, there could hardly be found greater nicety in the courtesies of life than is shown in all this. What is more, it is the rule, not the exception, and this in Kikuyu is not to be disregarded or even lightly observed.

As with all wild men, crime as defined in the community is severely dealt with, though inconsistently, according to our code. For the theft of a sheep, the penalty is a fine of ten sheep, which, incongruously enough, is the same as attaches to live-stock trespass in a plantation.

Stealing honey from a mwatu in the forest—it may be a day's journey from anywhere—is a serious offence, punished by a fine of five sheep. Murder is compounded for to the nearest of kin at the rate of a hundred sheep for a man, thirty-three for a woman. In homicide, whether culpable or justifiable, the same composition is paid; so also for loss of life where any one can be traced to have been primarily the accidental innocent cause. But though the payment of this blood-money is held by law to be due, it is by no means always forthcoming unless the claimants are strong enough to exact it. Herein lies one great difficulty to the European administrator.

In many respects the Akikuyu differ in their customs from all other African tribes I have ever come across. They are subject to no paramount chief, and acknowledge no other authority than that of their heads of families, whose influence about equals that of heads of families in great Britain. In the management of their affairs they are practically independent of one another, and they act independently, except when a common cause urges them to combine. They make no profession of witchcraft, neither have they any great fear of the dead, though they have a natural repugnance to touching a human corpse. Like the Akamba, Ataita, I think, and Masai, they do not bury or mourn their dead. In this, again, they are exceptional. They eat no other flesh than that of domestic cattle, sheep, and goats. Wild game, furred or feathered, fish, or domestic poultry they will not touch.

Amongst them prevails the extraordinary practice of isolating the male kind of their sheep and goats from the remainder of the flock, not allowing them to go out and graze, but keeping them in their villages. A common feature of the evening landscape all over Kikuyu is the spectacle of women and young girls doubling home to their villages with huge loads of sweet-potato tops (miliyo) on their backs. It is for feeding such animals that these miliyo are required.

Another point about them is, they have none of that wild-beast-like craving for meat, for which the majority of African tribes are so famous that they have earned for themselves the character of *feræ naturæ*. Nyama (meat) is the chief craving and topic of conversation with Central African tribes; and if they find themselves in a position to indulge it, they will do so to an extent, so disgusting, as to place themselves below the brute creation. All who have had dealings with the tribes of Nyasa in their primitive state will know that if occasion offers they will gorge themselves with meat, day and night for days on end, until they become downright ill, tie strips of raw bark round their heads, and are compelled to desist until nature recovers herself. On the Konde plains in the early eighties I have seen my Ajawa—otherwise known as Yaos—cut open the stomach of a buffalo just dead, take their two hands full of the contents and squeeze the juice therefrom into their mouths; while others cut up the stomach itself and ate it raw—yet they were regularly and plentifully fed with vegetable foods and meat in reasonable quantities. On my various expeditions from Deep bay into Henga I have seen my Ahenga, a caravan of thirty or more, so gorge themselves on meat, on one eland in particular, that in twenty-four hours many of them could not walk. In 1885 the Atonga of Bandawi, when I was shooting elephants, were willing to carry my loads for no other remuneration than that of eating meat. "Let us go with him and eat meat only," they used to say. After nauseating themselves once or twice, they had satisfied their craving for the time being, and only wished to return to their homes.

Now, there is nothing of this in the Akikuyu, any more than in Europeans of healthy appetite. The Akamba, their neighbours, more nearly akin to them than any other tribe, do not resemble them in this. It is a common practice for them to set out in bands of thirty or forty men and boys for the sole purpose of hunting game, and having their fill of meat. From time to time during my stay in Ikamba, I used to encounter such bands coming from or returning to their villages. On the way out from Machako's to shoot, I remarked a large party of men and boys with no other baggage than bows and arrows resting at a stream near Bondoni. I asked one of the men who were with me what they were doing, and he replied, "They have been hunting game, and are going home." As they had no game with them, I questioned him as to what they had done with it. My informant slapped his stomach significantly, explaining, "It is here; Akamba, if they kill game, light fires and eat it on the spot, they do not carry any to their homes!" Probably the most bestial people in their appetite of any on the face of the earth are the Masai, whose food is meat, warm blood sucked from the necks of living cattle, and milk, often diluted with cattle urine.

Sir Richard Burton's description of the Bedawin of the Arabian deserts is largely applicable to the Akikuyu in their native forests. No one can travel in Kikuyu without remarking the extreme caution and suspicion prevailing amongst the people one towards another, still more towards strangers.

Stumbling and blundering along the dark slippery forest path, at every turn having to scramble over or under or go round fallen trees or other obstacles, you come suddenly on a Mukikuyu clad in his metal and feathers, his body glistening with therega and oil. He pulls up short directly he sees you, and calls out, "Muhoro" ("Friend"), to which, if all is well, the reply is, "Muhoro mwega" ("Good friend"). If this countersign is given, he strides out boldly to meet you, sticks the butt end of his spear into the ground at the side of the path, and clasps your hand, looking you straight between the eyes, and asking who you are, and whence you come. He meets you man to man. He knows not who you are, nor where you hail from. All he knows is what he sees, that you are a Muthungu, from whom—or at any rate, from whose followers—he has learned to expect trouble. It is for you now to do all in your power to disarm his suspicions. Create as favourable a first impression as possible. First impressions go for a great deal with wild men.

If you meet a Mukikuyu for the first time, he will do what I have never known the Nyasa tribes do, ask your name, and ask it again and again, repeating it after you to obtain its exact pronunciation. If you impress him favourably, he will question you more closely about yourself, and before parting will very likely tell you, "I want to be your friend; I am coming to see you; I will bring you a sheep!" He is as good as his word; he turns up with the sheep, and some of his relatives and friends. Probably he will like to stay a day or two in your camp, perhaps a week. He will come to you when he thinks his visit has been long enough, and will say, "Tuinuke" ("Let us go away"). It is customary then to make him some suitable little present in return for his gift—not so much on the score of its value as of its being a pledge of mutual friendship. He now considers he and you are friends. He acts his part, too, his attentions proving a nuisance at times.

There is a great deal of force of character in the Akikuyu. It is this, probably, that has earned for them their reputation for excitability when brought into contact with strangers, of whom they are suspicious, and to whom they are naturally inclined to be hostile. In the majority of cases, in my experience, travellers in Kikuyu owe any rough treatment they have to complain of either to their ignorance of *savoir faire* with wild Africans, or much more frequently to the secret misconduct of their followers. It is no country to travel in unless you are on good terms with the inhabitants, for they are round you in the forest, within a spear's throw it may be, and you see nothing of them. Caravans who have invited hostilities experience what these mean at every turn. Stragglers are cut off and killed. It is not safe for a man to leave the path. No one can go out of camp to collect firewood, or even leave the light of the fires at nights. The matter-of-fact business-like way in which the Akikuyu conduct negotiations with Europeans shows a high order of intelligence. If you have a proposal to make, they hear what you have to say, make certain that they understand you thoroughly, if need be asking questions, and then withdraw to confer with one another to decide what reply to give you. Councils of war of this description are usually held in the open away from every one, either on an exposed hill-top, or in the middle of some open flat. There they will sit down in a circle, with a fire in their midst and their spear-blades forming a ring-fence at intervals around them.

On my journey into Maranga, on the south-western slopes of Kilinyatha, at the end of 1899, I had an instance of this. My journey, I should say, was undertaken for the purpose of opening up friendly relations with the Akikuyu there; my objects being to procure food supplies for my starving garrison in Kitwi, and, if possible, to obtain men for local labour, and to fill a certain number of vacancies in our native police. No European had preceded me by my route through northern Kitwi, and across the Thana (Upper Tana) at Kanau. Dr. Peters had travelled a couple of days or so to the westward, so from previous experience of following anywhere in his wake, I feared rather for the sort of reception which awaited another Muthungu. Arriving on some open downs above Ngulli's village on the sixth day out from Kitwi, the behaviour of the first Akikuyu we saw appeared anything but reassuring. Terra-cotta-coloured figures armed with spears and shields could be seen running along the paths in front of us and across us in twos and threes in ominous silence. No women or children were visible, always a bad sign. As evening was setting in, I was afraid darkness might descend on us before some sort of *modus vivendi* had been established with the natives around us, so called a halt in the open close to a village, and sent in word to the people to say that a European had come to their country, and wanted to be their friend. It proved to be Ngulli's village. About a quarter of an hour later, to my surprise, he came out to me, accompanied by about a score of as fine men, fully armed with spear, sword, and shield, as I have ever seen.

He himself was an old man, about sixty years of age or more, with grey hair, a bright open countenance, and eyes which, though somewhat dim, had unmistakably the light-brown pupils of European races which are commonly found amongst the Akikuyu. There was nothing about him to denote that irritable, treacherous disposition of which I had read so much and heard more. All was plain sailing as far as he and his people were concerned. He listened to what I had to say to him through the medium of an interpreter—I had not then learned to speak Kikoyu—asked a few pertinent questions, and replied, "Ni mwega" ("It is good"). He promised to communicate with the other leading men of Maranga, and ask them to come in and meet me. For days there came in a constant stream of quasi-chiefs, with whom in each case I had to go through the same ordeal as with Ngulli. During this time I took it we were under observation, on probation ; so I allowed none of my men to leave camp unless accompanied by Ngulli's people, as, in the event of their misconducting themselves, as Africans will do at the expense of their own colour, when under the ægis of the European, I knew Ngulli's people would let me know, where otherwise I might remain in ignorance until we had lost our good name and fame, and possibly have involved ourselves in hostilities.

At the end of about a week, during which I daily pressed for a settlement of the question, about a dozen of the principal men of Maranga adjourned by themselves to the open flat beyond the Muthambi, and there sat down in a circle with a fire in their midst, and talked until far on into the afternoon. All that could be seen of them was a dark group huddled together, their spear-heads aligned against the opposite slope, and the smoke of their fire blowing to leeward. Having agreed what to do, they came in, and Zyuma, their spokesman, notified me of their answer. All the European had asked, he said, they conceded. They gave him their friendship in return for his; they would give him food, some as a gift, more for purchase. They would give him men to work. This they fulfilled to the letter. My only regret was having to leave them so soon; though, as I told them, I hoped to visit them again, and meantime would keep touch with them through their men.

The traveller in tropical Africa, in reckoning up past camping-grounds, as a rule appraises them by their discomforts and drawbacks. During over two years under canvas in the East Africa Protectorate, my camps varied vastly, with one or two exceptions only, in degree of discomfort. I can think of two only of some hundreds which left nothing to be desired, and which for the time being appeared to be paradise on earth—on the Muthambi, and in a Tamarind grove, on the right bank of the Thana river, after crossing the desert plains of Thayisu.

Nothing could have been more delightful than our stay on the Muthambi, in a cool grove of monster fig trees, with the river flowing through meadow land within 40 yards of my tent. The climate was perfect—bright warm sunshine, yet not so hot as to be enervating. Perfect peace prevailed as well in the animal world, for though in a populous district, as domesticated in appearance as any country homestead in England, the Akikuyu molest no wild game, furred or feathered. Every morning before sunrise wild duck used to fly in, quacking loudly, to dash down on the stream in front of my tent, and swim about all day, only taking wing if compelled to do so, to return again to the same spot a little later. During the daytime guineafowl flew up into the fig trees overhanging our camp, to sit there pluming themselves or roosting in absolute indifference to what was going on below, with men talking and moving about, and fires burning. In the sweet-potato plantations on the opposite bank of the river francolins could be seen craning their necks and listening, or scratching for food, within a stone's-throw of natives digging potatoes or weeding. It seemed nothing short of sacrilege to fire a shot in such a sanctuary as this! Instead of shooting, when not occupied with my newly-found friends, who thronged our camp all day long, I collected Lepidoptera with such good results that, exclusive of moths, I secured several new species of butterflies, one a lovely little hairstreak. I also laid the foundation of my Kikuyu vocabulary.

The vice of the Akikuyu is drunkenness. High-spirited and pugnacious, too, as these people are amongst themselves, the consequences are more serious than to merely render them drunk and incapable—the normal pastime with the chiefs and headmen of so many Bantu in time of peace. The wherewithal (ndohi) is fermented from either sugar-cane (igwa) or honey (uki), not from grains, roots, or bananas, which as a rule constitute the African's malt. In most villages they have an nderri, a monster tree-trunk, in which are two rows of holes parallel with one another along the entire length. The *modus operandi* is as simple as the implements employed. As soon as the cane has been peeled and cut into chunks 3 or 4 inches long, it is put into these holes and pounded by two rows of women armed with wooden pestles. The pulp is taken out and placed in calabashes, and water is added. The juice is then expressed by hand, and put into other vessels to ferment. From what I have seen of the results, sugar-cane ndohi is more potent than that fermented from grain. Honey ndohi is more potent still. Were it not for drink, which renders the Akikuyu at any turn liable to commit acts of murder and other violence on the impulse of the moment, no European possessed of tact and some knowledge of the language need experience trouble in travelling in Kikuyu, even should he have no force at his back. Drink at once arouses their innate suspicion of and hostility to all strangers, more especially Europeans with Arab or Swahili followers, whom they have had good cause to treat as foes, for, after the manner of their kind, they have committed excesses whenever possible, by catching the people for slaves, by interfering with their women, and by looting their live stock and plantations.

In my travels amongst the Akikuyu, including some of the wildest of the tribe—viz. those of Maranga and others at the higher altitudes in south-west Kikuyu—I frequently went about with no more following than one or two men, and no more defensive weapon than a specimen-gun or a butterfly-net. Yet I only experienced personal violence on one occasion—in Maranga, at the hands of a party of men drinking in a banana plantation, one of whom, seeing our caravan passing, rushed out on me with his drawn luhyu, without the smallest provocation, thereby letting us in for an affray which for a time looked like ending in wholesale disaster to ourselves. But for the timely intervention of one of the two Akikuyu guides with me at the time, who caught the man's wrist from behind, I must either have been killed or seriously injured.

In his magnificent contribution to African travel and research, 'The Great Rift Valley,' Dr. Gregory states, in a brief appendix on the Akikuyu, that little is known of them, that they are not of a purely Bantu origin, but contain both Bantu and Hamitic elements. He says, further, that little is known of their language; that this is certainly not Bantu, but is allied to Masai, illustrating this by five names of geographical objects, *e.g.* "mountain," "hill," "river." Had Dr. Gregory been able to collect a reliable vocabulary of the language, he would never have arrived at such a conclusion. Taking the words given by him in illustration, these show he has been misinformed. In Kikuyu, "mountain" is *not* "ngongo," but "mulima;" "hill" not "ngongo," but "kilima;" "river" not "luyi," but "luwi"—all purely Bantu.

However, to clear up any doubt there may be as to whether or not Kikuyu is a Bantu tongue, I will give a selection of nouns representing some twenty classes in all, for comparison with other Bantu languages, *e.g.* —

CLASS 1.—Prefix: sing. "mu-," pl. "a-."

Mundu, andu, = person
Mukikuyu, Akikuyu, = native of Kikuyu

CLASS 2.—Prefix: sing. "mu-," pl. "me-."

Muhya, mehya, = sorghum
Muhu, mehu = ash

CLASS 3.—Prefix: sing. "mu-," pl. "mi-."

Mugunda, migunda, = plantation
Munyerri, minyerri, = Whydah finch
Musiyi, misiyi, = village

CLASS 4.—Prefix: sing. "mw-," pl. "mi-."

Mweri, mieri, = moon
Mwatu, miatu, = beehive

CLASS 5.—Prefix: sing. "i-," pl. "ma-."

Itimmu, matimmu, = spear
Ikunnu, makunnu, = mushroom
Ihuri, mahuri, = lung
Irima, marima, = pit

CLASS 6.—Prefix: sing. "li-," pl. "ma-."

Liigwoya, maigwoya, = wild lavender
Liitholli, maitholli, = te

CLASS 7.—Prefix: sing. "lu-," pl. "n-."

Lugara, ngara, = oval-shaped bark-rope basket with large meshes
Lugiyo, ngiyo, = potsherd

CLASS 8.—Prefix: sing. "lu-," pl. "nj-."

Luoya, njoya = feather
Luiligu, njiligu, = ine

CLASS 9.—Prefix: sing. "lu-," pl. "ni-."

Luenji, nienji, = razor

CLASS 10.—Prefix: sing. "ka-," pl. "tu-."

Kahe, tuhe, = boy
Kahyu, tuhyu, = knife

CLASS 11.—Prefix: sing. "ki-," pl. "i-."

Kihatu, ihatu, = broom
Kindu, indu, = thing
Kikammi, ikammi, = dendrohyrax

CLASS 12.—Prefix: sing. "ki-," pl. "vi-."

Kikwa, vikwa, = yam

CLASS 13.—Prefix: sing. "ki-," pl. "si-."

Kiunguyu, siunguyu, = fish
Kiondo, siondo, = cord basket

Class 14.—Prefix: sing. "ki-," pl. "zi-."

Kihuruta, ziburuta, = butterfly
Kiaru, ziaru, = journey

Class 15.—Prefix: sing. "n-," pl. "ma-."

Ngingo, magingo, = neck

Class 16.—Prefix: sing. "u-," pl. "ma-."

Ulirri, malirri, = bedstead

Class 17.—Nouns having no singular prefix.

Litwa, malitwa, = name
Njeneni, manjeneni, = star
Handu, mahandu, = plant
Mondo, mamondo, = square skin bag
Utta, miutta, = bow
Ngwachi, mangwachi, = sweet potato

Class 18.—Nouns having no plural prefix.

Luhe, he, = hand
Luhya, hya, = horn

Class 19.—Nouns with irregular plural.

Handu, kundu, = place
Wokko, mokko, = arm
Muturra, marra, = intestine
Butu, mawutu, = eyelash
Mukubbi, ukubbi, = masai

Class 20.—Nouns with no plural.

Hinya = strength
Ruthiya = sense
Imi = dew
Liuwa = sun
Hiti = hyæna
Njeggi = porcupine
Nduma = darkness
Nyotta = thirst
Ngaragu = hunger
Turru = sleep

Let us now take some of the common verbs—

Ku nengena = to say
„ ikara = to remain
„ handa = to plant
„ ruara = to be sick
„ turra = to forge
„ liha = to pay
„ ina = to sing
Ku onna = to see
„ syara = to beget
„ kwa = to die
„ hata = to sweep
„ enja = to shave
„ haka = to smear
„ tegga = to trap

A few of the most used adjectives are—

-Neni = large
-Nini = small
-Ega = good
-Thugu = bad
-Raya = long
-Kuhi = short

Some of the commonest adverbs are—

Haha = here
Harya = there
Lugurru = above
Ithereru = below
Kahora = gently
Munno = utterly

Numerals are as follows—

-Mwi = one
-Iri = two
-Thatu = three
-Inya = four
-Kummi = ten

Decades are expressed by mulongo, milongo; *e.g.* milongo ithanu = fifty.

The above list is merely a small selection from my carefully compiled vocabulary of several hundred words, among which I cannot discover one which is not of purely Bantu origin.

FAUNA AND FLORA OF KIKUYU.

As I have previously remarked, the fauna of Kikuyu is distinct from that of any other part of the Protectorate. It is limited, yet no doubt open to considerable expansion as the country becomes better known.

In the vast primæval forests of the higher altitudes elephants (njoggu) abound, and are not molested by the natives, though they cause infinite havoc in their plantations, where in a single day or night they will destroy whole crops of beans or red millet, pulling up the latter bodily, chewing the juicy stalks, and throwing down the roots. These elephants have an easy life, remaining in one locality for as long as they please. They are not compelled to undertake long forced marches to escape from the persecution of man. They have not to traverse large, arid, hot, desert-like tracts of open country in search of water or new feeding-grounds. In some localities the El Dorobo hunt them, using for the purpose a harpoon with a mobile poisoned barb, one of which was taken out of the leg of a bull elephant killed by myself on the slopes of Kiambiruiru in 1898.

Rhinoceros (hurya) are not found in the depths of the forest, but low down on the escarpments. Occasionally I have come across them at altitudes of 8000 feet in the neighbourhood of such open flats as Roromo, Lali, and Ngaralika. They are unpleasantly plentiful on the sparsely timbered slopes between Maranga and the Tana river. Returning through this country to Kitwi on January 14, 1899, I had a narrow escape from a wounded bull. He charged me, came up with me, and overran me by a few yards as I lay prone in the scanty grass. In this position I killed him with a lucky, almost snap shot in the heart. He had an abnormally massive pair of horns, the anterior one 21 inches long. Dr. Kolb, the German traveller, was subsequently killed by a rhinoceros not very far from here, in the autumn of the same year. This rhinoceros is, of course, the prehensile-lipped species (*R. bicornis*), with very small horns—as a rule—the anterior horn of the adult male rarely measuring more than 16 inches. As far as I know, hippopotamus (ngu) are found only in the Thana river, and low down in its larger tributaries, such as the Chanya and Thika. In the Thana they are plentiful, and have no fear of man. I shot one large bull, and could have shot fifty without putting myself to any great trouble to do so.

Carnivora are represented by the leopard (ngarri) of an unusually large type, very often dark-coloured; the spotted hyæna (hiti); the black-backed jackal (mbwe); the common serval (kirumi), also an absolutely black form (simba), of which I have seen the skins of two in the possession of a Mr. Tarte at Nairobi; the wild cat; the genet, of several species probably, though I have only killed two examples of one; and numerous most destructive ichneumons, the commonest of which is *H. gracilis*, in habits as much arboreal as terrestrial.

There are hares (waruvukku) on the open grasslands at Mayimoru and Lali—here and there an odd one. Porcupines (njeggi) are the bane of the country, and most destructive in the plantations—so much so that, when the maize crops are ripening, the natives have to be up all night shouting and scaring them. In the more open country, such as that about Fort Smith, there are ant-bears; but I have only known of one being killed, by Mr. John Scott, who shot him at night in the act of burrowing at the side of the road.

Three or four times I have seen in the forest at night what I take to have been the little-known lophyomys (*L. imhausi*). During my absence at Nairobi, my servant Bvalamkombi killed one at night in my zariba at Boromo, which was surrounded by, and indeed cut out from, black forest. He duly skinned and preserved the animal with his usual care to await my return; but on the night of my arrival, after I had seen it, some marauding beast made off with the specimen. There are no large antelopes, nothing larger than the bushbuck (*Tragelaphus sylvaticus*, probably) of unusually large size, with splendid heads of horns. Smaller forms there are also, such as Cephalophus, Nesotragus, Nanotragus (?) in the open country round Fort Smith and Madokwa. A common antelope in the Boromo forest has been determined by Mr. Oldfield Thomas, from an entire specimen which I was able to procure for him, as *Nesotragus moschatus*.

As is to be expected in forest country, monkeys are plentiful. The following are commonly met with: a large, steel-blue coloured, shaggy-coated, most truculent-looking baboon (nuggu); a white-chested Cercopithecus, probably *C. albigularis* (gimma)—very numerous, audacious, and destructive to crops; a conspicuous but exceedingly shy Colobus, *C. occidentalis* (guyu), inhabiting only the darkest depths of the forest, where his deep guttural "urra-urra-urra" is generally the first harbinger of dawn—"mberi wa ngwari" ("before the francolins"), as the Akikuyu would express it. A small grey squirrel is very common, and tame. The most remarkable animal of all is the dendrohyrax, or procavia (kikammi), denizen of the forest from upwards of 7500 feet, distinguishable at once by his far-reaching call, uttered only at night. No one can camp where the kikammi occurs without noticing this, for though quite a small creature, no larger than a rabbit, it has a call resembling a policeman's rattle, but more powerful a good deal. It commences with some five bars of the rattle of about three seconds' duration each, with about two seconds intervening, and then changes into long-drawn wails, lessening in power until these die away into a series of gradually expiring sighs. For all that I tried hard to obtain a series of specimens of this extraordinary creature, I was only able to secure one, a female brought in alive to me by a Mukikuyu. This Mr. Thomas has pronounced to be a new sub-species. My difficulty was due to the animal being arboreal and nocturnal in habits, living in monster trees where in the daytime it sleeps in some hollow in the trunk or in the branching-fork of a huge limb concealed from view, awakening at night to feed on the foliage, and startle creation with its weird call. Another noisy inhabitant of the forest is a galago, also nocturnal, of which I was not able to secure an example.

In game birds—as is only to be expected—Kikuyu is poorly represented, whereas in small birds the forest abounds to a careful observer. There are three species of francolin at least, probably several more. *Pternistes infuscata* (mungwethi), one of the bare-throated francolins, is commonly found in the plantations at the lower altitudes—not, I think, above 7500 feet. *F. schuetti* (ngwari), one of the feather-throated francolins, is a native only of dense forest and undergrowth at all altitudes. This bird roosts in the trees, is never seen in the open, is almost exclusively insectivorous, and is remarkable for its noisy screeching in the mornings and evenings. *F. jacksoni*, another feather-throated species, probably the finest of all known francolins, was originally discovered high up in the bamboo forests on Kiinandarwa by that good field naturalist whose name it bears. Until last year only the male was known to science; but Lord Delamere, when travelling in Central Africa to make the fine collection of birds lately presented to the British Museum, secured a good series, male and female, of which he kindly reserved a male for me. I do not know this francolin's native name. Helmeted guineafowl (nganga) occur up to 6500 feet, above this I have not come across them. Potato plantations are their favourite resort, and there they feed largely on the tuber of the sweet potato, as do the bare-throated francolins. Quail (kamakiarumi), chiefly *C. capensis*, are plentiful at certain seasons in the plantations round Fort Smith, and in the open country up to 7500 feet. Above that I have not seen any.

Nowhere have I found waterfowl in any considerable numbers, but there occur widely throughout the country the Egyptian goose (*C. ægyptica*), the yellow-billed duck (*A. xanthorhynca*), and the sombre-spotted duck (*A. sparsa*). All duck are indiscriminately called by the Akikuyu, "thambilli." Egyptian geese are to be seen everywhere on the upper Thana river, usually in pairs, asleep on the strand, or on rocks or dead trees in mid-stream. At the time of my visit to that river I saw no duck, and no other edible birds of any sort than an occasional pair of ibis. Yellow-billed duck are found quite at high altitudes on the merest streams, where they are exceedingly tame and have no fear of man, probably because the natives never molest them. This also applies to the spotted duck. Snipe of the two well-known species—*G. major* and *G. nigripennis*—occur in small numbers on swampy ground at all reasonable altitudes. I have shot them on Lali flat, and have seen them in the swamp below Fort Smith and elsewhere in the neighbourhood. Like many other tribes, the Akikuyu have no name for the snipe.

The green pigeon (*Treron delelandii*) is to be had wherever there are wild fig trees, whose fruit forms almost its sole food. Several species of doves frequent the plantations at all inhabited altitudes, and are fond of congregating in the Croton bushes to feed on the beans. High up in Kikuyu—that is, above 7500 feet—there is a medium-sized green parrot with orange-tipped pinions, remarkable for the regularity of its morning and evening flight over the treetops, and its discordant screeching. It is difficult to shoot them, as they fly high and do not perch until their objective has been reached. In six months I shot two, losing one in the undergrowth. During my time in the forest at Roromo, I saw few large birds—in fact, only one pair of large owls; the ubiquitous and precocious white-necked raven; vultures of two species picking the corpses of the Akikuyu; an occasional pair of blue herons, or egrets, on Lali flat; and once or twice in the depths of the forest a black eagle with a topknot. The commoner small birds are the black and white shrike; a rose-billed blackbird—not found, I think, below 7500 feet; bulbuls, most destructive to ripe tomatoes; fly-catchers, very friendly to man; finches, including the conspicuous whydah finch; warblers of many species; honeysuckers of at least three species; and sunbirds, very partial to the flowers of an orange teazle.

Reptiles are represented by crocodiles (kingang) in abundance in the Thana; no snakes, I think, at the higher altitudes, other than a slow-worm—of which I sent Dr. Günther two examples collected at 7700 and 7800 feet respectively; many batrachians, chiefly arboreal; lizards in extraordinary variety; chameleons, of which the commonest (kiimbu) has three horns, rather over an inch long, on the frontal bone. There appear to be no scorpions, venomous centipedes, or spiders.

Red ants (tharakku) are the one noxious pest, found at all altitudes, up to as far as I have ascended. As a rule, they frequent the banks of streams or moist ground. On the Muthambi river they proved a positive scourge, and one night compelled me to abandon my tent. White ants (mithuwa) do not occur at the higher altitudes; for instance, I found none at Roromo. Entomology affords an entirely new field in most orders of insects—in fact, I think I may say in all except Lepidoptera. In this order Rhopalocera alone have been collected to any extent by such travellers as Mr. Jackson, Mr. Neumann, and myself, but are by no means worked out, as may be judged from the fact that my last consignment from Roromo and the country between that place and Nairobi included six novelties.

Heterocera, I believe, have not been collected by any one except myself, with wha material results will not be known until Sir George Hampson is able to work ou my collections.

The flora of the protectorate has already been described by Dr. Gregory, leavin me nothing to contribute beyond my own rough observations, supported by n scientific knowledge. On commencing the ascent into Kikuyu, the first object t be noticed by the everyday traveller is white trefoil growing in juicy green patche at the side of the path. No mention is made of it, I think, by Dr. Gregory, bu common watercress grows luxuriantly in some of the streams north of Fort Smit —the Ruarka for one. I think I was the first to make this discovery, in 189 and then sent some samples to various people at Nairobi. A common dish mine used to be roast francolin and watercress! In the neighbourhood of Fo Smith I have not seen the blackberry bramble (mutari), though it should occur at that altitude. It is to be found, however, about 400 feet higher on the Uganda road, growing sparsely here and there. Bracken (muthillu) grows at the foot of the Nairobi escarpment, and practically all over Kikuyu—the higher the altitude the more luxuriantly. At the headwaters of the Chanya, in Kegiyo, it grows to an extraordinary size, the stems as thick as a man's little finger, and in height over a man's head.

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On the Ikamba-Masai escarpment there is a very beautiful tree, attaining commonly a height of 80 or 100 feet, with rich green foliage and a mass of sweet-smelling pinkish-lilac flowers. There are a number in the forest between the Nangara river and Ngongo Bagas.

Nothing very European occurs at low altitudes, *i.e.* below 7500 feet, except—as I have already mentioned—white trefoil. Here, in addition to this, there is a larger species of trefoil, with a pink flower, resembling very nearly the white and pink clover of Great Britain, but with a smaller and smoother leaf. From 7700 feet upwards, the blackberry grows in great luxuriance in the openings of the forest—not the *Rubus* with amber-coloured fruit found here and there on the tops of the Ikamba hills, but another species, with a narrower, more pectinate leaf, and dark mulberry-coloured fruit, almost as dark as the blackberry of Great Britain. On the outskirts of the forest round Lali are blackberry clumps, 12 feet high and more, a mass of flowers or fruit according to the season. Considerable agility is displayed by the Akikuyu boys in climbing these by means of long stout poles placed resting against the tops of these clumps. Monkey-like, they ascend these with their bare feet and hands, and whilst they pick and eat the fruit with one hand, they retain their balance with the other.

In the neighbourhood of Roromo and Lali, from 7700 to over 9000 feet, European forms are very numerous: on the open flats, thistles, some flowering with a single head from the ground, others with thorn-like prickles breast-high; yellow ragwort—a favourite resort for butterflies, moths such as the Syntomidæ, Coleoptera, and Hemiptera; bulrushes; meadow-rushes; everlastings; gladioli; dandelions large and small, forming genuine puffs; wild sorrel; buttercups; docks, with a long narrow leaf; teazle, with an orange flower; devil's bit; meadow orchids; and last, but not least, that unobtrusive strawberry-like *Potentilla* with white flower, the first to put in an appearance after the coltsfoot in early spring in the hedgerows at home. Nowhere on the flats is the grass longer than on meadow-lands at home. Many of the grasses are familiar forms. In places the turf is soft and springy with moss. The black mushroom (ikunnu) grows abundantly. In the forest the first familiar object to attract, or rather compel, recognition is the stinging nettle. There are two kinds: the savayi, almost identical with the British nettle, eaten as spinach by the Akiyuyu, and the isinaihehi of monstrous growth, 5 feet high and more, with prickles capable of penetrating stout khaki cotton.

What the whitethorn is to country people in England the Sodom apple (muturra) is to the Akikuyu, planted round villages in a ring fence and along the paths through their plantations. Elsewhere in tropical Africa it grows as a mere bush. In Kikuyu it develops into a respectable tree, 15 to 20 feet high, with sprawling limbs covered with the most uncompromising massive hooked thorns, capable of tearing the flesh out of any one hung up in them. For marking boundary-lines, cuttings of the liigwoya are planted—a bush resembling lavender somewhat, with an aromatic turquoise blue flower, and of extraordinarily rapid growth. Divisions in plantations are usually marked by three or four tufts of a kind of pampas grass, planted in line a few yards apart. Jasmine, which grows commonly all over the Protectorate, even on the hot lowlands of the coast, grows at all altitudes where I have been in Kikuyu. It is in flower every few weeks, off and on, throughout the entire year. In the Roromo forest there grows that long tendril-like burr which it so delighted one as a child to pluck and throw on to the backs of one's unsuspecting elders unknown to them. The most remarkable tree in the forest is a fine juniper. Another and larger is the mutarakwa, used chiefly for building, which I think is a podocarpus.

It is possible in a country and climate such as this to grow vegetables and flowers as easily as in Europe. At the beginning of the May dry season at Fort Smith I started a garden—the old garden having been allowed to go to rack and ruin—and within four months had raised fit for use, not only such quick-growing vegetables as lettuce, turnips, beans, and peas, but carrots, beetroot, and cabbages of good size. There was no rain during this time, so I was obliged to irrigate by hand to give the seeds a fair start. Later, in my zariba at Roromo, I achieved even better results, growing what I have never raised elsewhere in tropical Africa—rhubarb. In the garden at Fort Smith, which I found sadly neglected to what it had been in former days, vegetables would grow freely when only self-sown. In June, 1899, I remarked no less than three crops of cress standing at the same time—one, of course, being the original parent. Peas, beans, and lettuces commonly grew in this way. As for potatoes, they would grow *ad infinitum*. Alpine strawberries bore fruit, small on this account, off and on the entire year through. Mr. Wise, a Protectorate official, and Mrs. Snowden are, I think, the only people who have done any flower-gardening in Kikuyu. Mr. Wise's dahlias and Belgian pansies, and indeed quantities of other flowers, would have done credit to any cottage gardener in England. Mrs. Snowden's sweet peas and stocks at Ikwiakwi, 7500 feet, will long dwell in my memory. From these I obtained seed to produce my favourite flowers at Roromo—destined to occasion yet one more pang of regret when the time arrived for me to leave all, preparatory to going south to join in the war.

THE ERUPTIONS IN MARTINIQUE AND ST. VINCENT.

By H. N. DICKSON, M.A., B.Sc.

THE terrible loss of life occasioned by the volcanic outbursts in Martinique and St. Vincent, and the resulting natural tendency to magnify the slightest deviation from the normal in seismic or meteorological phenomena in other regions, make it almost impossible that a complete and accurate account of what is probably one of the most profound and widespread disturbances which has affected the Earth's crust within historic times, should be obtainable for a considerable period. The detailed scientific study of local phenomena will no doubt be fully carried out, and it seems likely that it will bring to light many new facts of supreme importance. But the mere distribution of the reports already received from disturbed areas is sufficiently striking and suggestive to warrant an attempt to weave them into a connected story—a story which fuller information seems likely to modify chiefly in matters of detail. The principal sources of information available as yet are the telegrams published in the daily papers, letters and papers received from the West Indies, and the summary of events and articles by Prof. J. Milne, F.R.S., in *Nature*.

Although perturbations of unusual strength had been noticed in Venezuela and St. Vincent from October, 1900, as stated by Mr. André in his paper (p. 60), the first indication of the present disturbance appears to have been observed in Guatemala on April 8, when a series of earthquake shocks began. This continued till April 24, and culminated on the night of April 18, in what Prof. Milne describes as "a very heavy earthquake," which "was recorded in the Isle of Wight, and might have been recorded anywhere in the world."

In a letter, dated Gualan, May 7, published in *Nature* (p. 150), Mr. Edwin Rockstroh says—

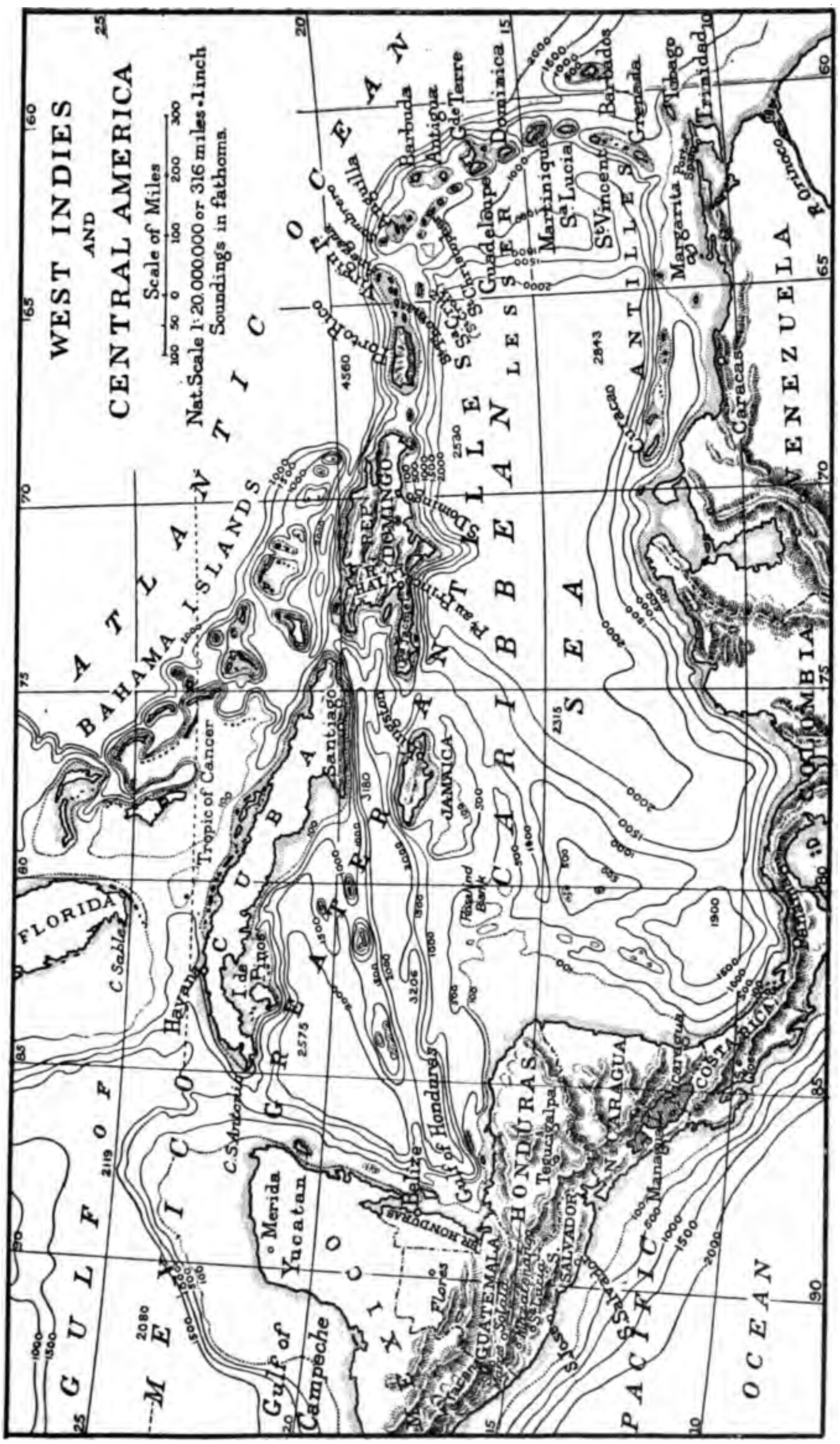
"At 8.25 p.m. of April 18 an earthquake of more than thirty seconds' duration affected a large part of Guatemala, Eastern Chiapas, and Western Salvador and Honduras. The intensity of the movement was greatest in Western Guatemala, where the second and richest city of the country, Quezaltenango, was completely destroyed, with the loss of about five hundred lives. Completely ruined also were Sololá, San Marcos, and its sister town San Pedro Sacatepequez (more than two hundred lives being lost), and the same happened to Retalhuleu and Mazatenango, important towns on the Pacific coast-plain, to the south of Quezaltenango. The places before mentioned are situated on the highlands, a little to the north of the great volcanoes.

"Besides the cities named, nearly every town and hamlet in the Departmentos of San Marcos, Quezaltenango, Retalhuleu, Suchitepequez, and several in Chimaltenango, are ruined, and perhaps every one of the many important coffee and sugar plantations in the western coast-region has had its buildings, machinery, and the aqueducts ruined. The total number of lives lost may be about eight to nine hundred.

"At the port of Ocos, only three houses remained standing, and the big landing-pier was broken near the land.

"In the city of Guatemala, most of the churches and some houses sustained slight damages; the same happened in Antigua (Guatemala). Escuintla and Amatitlan suffered considerably.

"The railways between Retalhuleu and the port of Champerico, and the one between Ocos and Coatepec, were interrupted by the falling


WEST INDIES
AND
CENTRAL AMERICA
Scale of Miles
100 50 0 100 200 300
Nat. Scale 1:20,000,000 or 316 miles = 1 inch
Soundings in fathoms.
ATLANTIC OCEAN
BAHAMA ISLANDS
Tropic of Cancer
FLORIDA
C. Sable
GULF OF MEXICO
Gulf of Campeche
Yucatan
Merida
C. S. Antonio
Havana
I. de Pinos
CUBA
Santiago
GREATER ANTILLES
HAITI
SANTO DOMINGO
St. Domingo
Pt. au Prince
Porto Rico
Virgin I.
JAMAICA
Kingston
Rosalind Bank
CARIBBEAN SEA
LESSER ANTILLES
Barbuda
Antigua
Gde. Terre
Guadeloupe
Dominica
Martinique
St. Lucia
St. Vincent
Barbados
Grenada
Tobago
Trinidad
Margarita
Curaçao
Caracas
VENEZUELA
R. Orinoco
COLOMBIA
Belize
Gulf of Honduras
BR. HONDURAS
Flores
GUATEMALA
HONDURAS
Tegucigalpa
SALVADOR
NICARAGUA
Managua
COSTA RICA
PACIFIC OCEAN
2080
2119
2575
3180
3206
2315
2843
2530
4560
1900
1000
1500
2000
100
500
25
20
15
10
60
65
70
75
80
85
90

of bridges and damage to the road. The railway between Guatemala and the port of San José remained unaffected and intact.

"In the eastern portions of Guatemala the shock was only weak. I was at the time on my plantation 'Germania,' and I did not feel anything at all.

"Until May 5 earthquakes of small intensity were still frequent from the city of Guatemala to the west."

In the "early days of April" the volcano of Mont Pelée (the "naked mountain"), the highest peak in Martinique, began to emit smoke. Mont Pelée stands near the northern end of the island, and rises to an elevation of 4450 feet, 44 feet higher than Ben Nevis. It was supposed to be extinct till the end of the eighteenth century, when a slight eruption occurred. Another eruption occurred in August, 1851. From that time Mont Pelée had been quiescent. On the night of May 2, symptoms of dangerous activity appeared; a letter written from St. Pierre on May 3 says: "We are under ashes since last night. The rumbling, which began suddenly at first, has become more pronounced. The volcano is smoking more and more. It looks like an immense fire. . . . Two days ago we had three shocks of earthquake in the same afternoon, but they were very weak." Next day a sea-breeze cleared the dust-clouds from the top of the mountain, but on May 5 a stream of boiling mud poured down the mountain, apparently from near the summit, following the dry bed of a torrent, and reaching the sea, 5 miles distant, in about three minutes. On the west coast the sea receded 300 feet, and the Puerto Plata and Dominica-Martinique cables were interrupted.

On the same day, La Soufrière, or Morne Garon, a volcano in the north of St. Vincent, and 90 miles south of Mont Pelée, showed signs of activity. La Soufrière was the scene of an eruption in 1812, which still ranks amongst the most terrific outbursts on record; the crater formed at that time, half a mile in diameter and 500 feet deep, was until recently occupied by a lake. At 3 p.m. on May 6 a dense cloud of steam arose from the mountain, and on the same afternoon the cables between Martinique and St. Vincent were broken. On May 6 a shock of earthquake was felt in the north-west of France and along the Mediterranean coast of Spain, especially in the district of Murthia. According to a note in the *Comptes Rendus* of May 12 (*Nature*, p. 112), the epicentrum of this disturbance is placed in the Mediterranean, to the south of Minorca. The state of affairs at Martinique was less threatening.

Early on the morning of May 7 violent explosions occurred on La Soufrière. The *New York Herald* gives the following description:—

"On Wednesday morning terrific explosions occurred, and at seven o'clock there was another sudden violent escape of steam. This ascended for three hours, when a quantity of material matter was ejected. At noon three craters appeared to open, and began to vomit lava. Six streams at once ran down the sides of the mountain, making an awful scene.

The mountain laboured heavily for half an hour after the appearance of the lava, and fire flashed around the edges of the craters. Tremendous detonations followed in quick succession, rapidly merging into a continuous roar. This lasted through Wednesday night until Friday morning. The thundering was heard throughout the Caribbean sea.

"The eruption began on Wednesday. A huge cloud in dark, dense columns, charged with volcanic matter, rose to a height of 8 miles from the mountain-top, and darkness like midnight descended. The sulphurous air was laden with fine dust, and black rain followed the rain of scoriæ, rocks, and stones. Numerous bright flashes, marvellously rapid, were seen, and these but intensified the horror inspired by the thunder of the earthquake, the roar of the lava, and rush of falling stones. Large areas of cultivation were buried, and the Wallibou and Richmond plantations and villages were totally destroyed, the former being partly submerged by the sea. On the windward coast seven plantations were totally destroyed. The whole of the Carib country in the same locality was covered with ashes and lava to the depth of 2 and 4 feet. Nothing green was visible. Besides vegetation, all live stock and buildings were destroyed, and the streams and rivers were dried up. There is now a water and food famine in the island; 1620 deaths are already reported. The deaths were due chiefly to suffocation by sulphurous gases, to lightning, and the burning lava masses."

A cloud of dust from St. Vincent reached Barbados between five and six on the same afternoon, having travelled eastwards, against the winds, a distance of about 100 miles, apparently in an upper current. The deposit in twelve hours attained the thickness of three-eighths to half an inch, and its weight was at the rate of 17·58 tons per acre, equivalent to nearly two million tons for the whole of Barbados. Dr. Longfield Smith's preliminary mineralogical examination disclosed "volcanic minerals and volcanic glass, the minerals predominating, and consisting chiefly of silicates of iron and magnesia, also a considerable proportion of quartz and some potash felspar" (*Port of Spain Gazette*, May 22). A similar fall occurred in Barbados during the eruption of La Soufrière in 1812, but the composition of the dust was widely different, the 1812 dust "being much finer, and containing very few mineral crystals."* It is also reported that "at 1.30 p.m. on May 7 there occurred a sudden outburst from one of the oil-borings, 900 feet deep, at Turner's Hall, Barbados, dust being thrown up to the height of more than 100 feet into the air." A strong earthquake shook St. Vincent at 10 p.m. on the 7th, and Prof. Milne reports that at 10.45, St. Vincent time, the seismographs in the Isle of Wight indicated the beginning of a disturbance, which reached its maximum at 11.16 p.m., and of which the origin was 60° to 70° distant from Great Britain. Prof. Milne suggests that these disturbances may be identical, and may represent a sub-oceanic convulsion which caused widespread interruption of the cables on that date.

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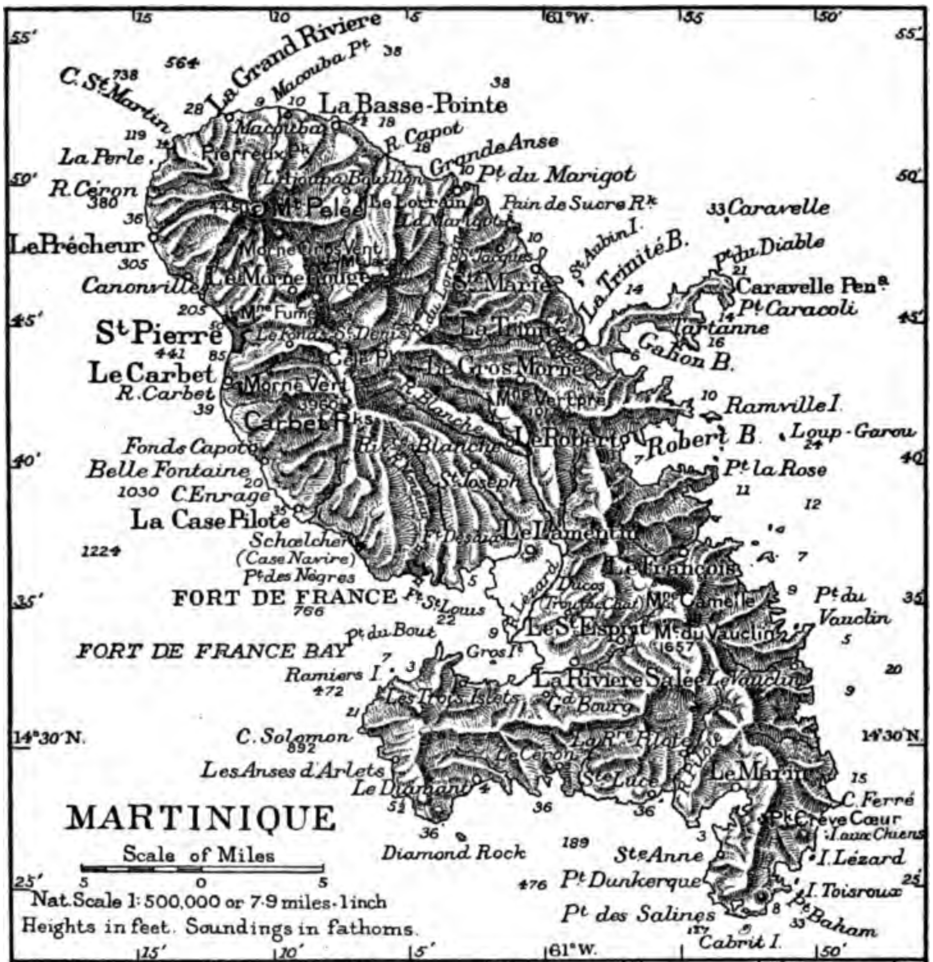
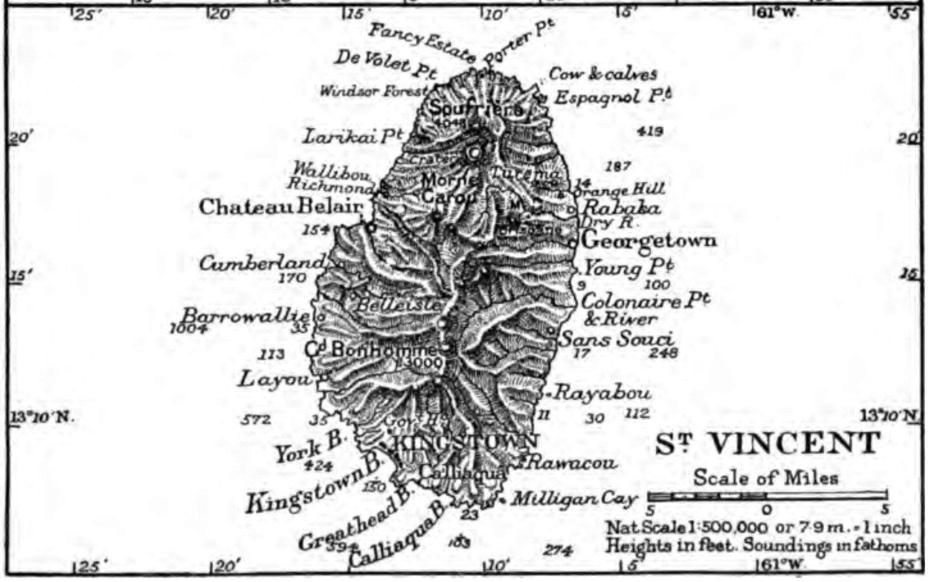
* See also a note by Prof. Bonney in *Nature*, p. 154.

On May 8, at 7.50 a.m., the town of St. Pierre was almost instantaneously destroyed, with the loss of some 40,000 lives. From the various accounts given, it is difficult to understand the precise nature of the occurrences which gave rise to the final catastrophe. The mud-stream of May 5 apparently issued from a new opening in Mont Pelée, and Monsieur Sainte-Mate, in his account, states that "between half-past six and seven o'clock on the fatal morning columns of white smoke suddenly emerged as if from a new crater, about 600 feet below the top of Mont Pelée, creating panic among the inhabitants of St. Pierre. At a quarter to eight a formidable rumbling was heard emanating from the mountain, as if a colossal fissure had been made from peak to foot, and then was beheld, amid black smoke which the eye could not penetrate, a great uniform mass, which burst with dizzy rapidity on the valley." Captain Freeman of the *Roddam*, according to one account, was talking to the ship's agent when he saw a "tremendous cloud of smoke glowing with live cinders, rushing with terrific rapidity over the town and port;" according to another he speaks of the "awful explosion that had preceded the shock to ourselves." M. Lhuerre, acting governor of Martinique, reports that "even early on the fatal morning no fresh catastrophe seemed to be impending, as cablegrams received at Fort de France described the situation as "stationary." But at 8.5 a.m., at the very moment when a steamer of the Girard Company was leaving for St. Pierre, an enormous volume of white clouds was perceived from Fort de France in the direction of St. Pierre. It seems uncertain whether the appearance of the "white cloud" which enveloped the city was preceded by an explosion of exceptional violence or not. If it was, the main force of the explosion must have been directed horizontally, or even downwards, otherwise the poisonous gases would probably have risen clear of the town. An examination of all the accounts, including the report of Prof. Hovey, suggests that the destruction of St. Pierre was rather the immediate result of the passage of a tornado or cyclonic system which had formed over an already existing crater than of a violent explosion. The atmosphere over the crater was apparently mixed with a quantity of poisonous and inflammable gas, probably sulphuretted hydrogen (of which a proportion of 1 per cent. would be immediately fatal), and the gas was ignited either by an electrical discharge, or by fires in the neighbourhood. The showers of dust and ashes can be fully accounted for by the intensity of the aerial vortex itself.

Dr. L. A. Bauer states in *Science* that serious magnetic disturbances began at at least two of the observatories of the United States Coast and Geodetic Survey within a few minutes of the catastrophe at St. Pierre, and continued till midnight of May 9. Numerous vessels also report disturbance of compasses.


MARTINIQUE
Scale of Miles
Nat. Scale 1:500,000 or 7·9 miles = 1 inch
Heights in feet. Soundings in fathoms.
61° W.
14°30' N.
La Grand Riviere
Macouba Pt
C. St Martin
La Basse-Pointe
Macouba
R. Capot
Grande Anse
Pt du Marigot
La Perle
R. Céron
Mt Pelée
Le Lorrain
Le Marigot
Pain de Sucre Rk
Caravelle
Le Prêcheur
Morne Gros Vent
St Aubin I.
La Trinité B.
Pt du Diable
Caravelle Pen.a
Pt Caracoli
Canonville
Le Morne Rouge
Ste Marie
La Trinité
Mne Fumé
St Pierre
Le Fonds St Denis
Tartanne
Galion B.
Le Carbet
R. Carbet
Morne Vert
Le Gros Morne
Mne Vert-pré
Ramville I.
Carbet Pks
Le Robert
Robert B.
Loup-Garou
Fonds Capot
Belle Fontaine
C. Enragé
R. Blanche
St Joseph
Pt la Rose
La Case Pilote
Schœlcher
(Case Navire)
Pt des Nègres
Le Lamentin
Le François
FORT DE FRANCE
Pt St Louis
Ducos
Mne Camelle
Pt du Vauclin
Pt du Bout
Le St Esprit
Mt du Vauclin
FORT DE FRANCE BAY
Gros Ilet
Ramiers I.
La Rivière Salée
Le Vauclin
Les Trois Islets
Gd Bourg
C. Solomon
La Rre Pilote
Les Anses d'Arlets
Le Diamant
Ste Luce
Le Marin
C. Ferré
Pt Crève Cœur
I. aux Chiens
Diamond Rock
Ste Anne
I. Lézard
Pt Dunkerque
I. Toisroux
Pt des Salines
Pt Baham
Cabrit I.


ST VINCENT
Scale of Miles
Nat. Scale 1:500,000 or 7·9 m. = 1 inch
Heights in feet. Soundings in fathoms
61° W.
13°10' N.
Fancy Estate
Porter Pt
De Volet Pt
Cow & calves
Windsor Forest
Soufrière
Espagnol Pt
Larikai Pt
Crater
Wallibou
Richmond
Morne Garou
Turema
Orange Hill
Rabaka
Chateau Belair
Dry R.
Georgetown
Cumberland
Young Pt
Belleisle
Colonaire Pt
& River
Barrowallie
Sans Souci
Cd Bonhomme
Layou
Rayabou
York B.
Kingstown
Rawacou
Kingstown B.
Calliaqua
Milligan Cay
Greathead B.
Calliaqua B.

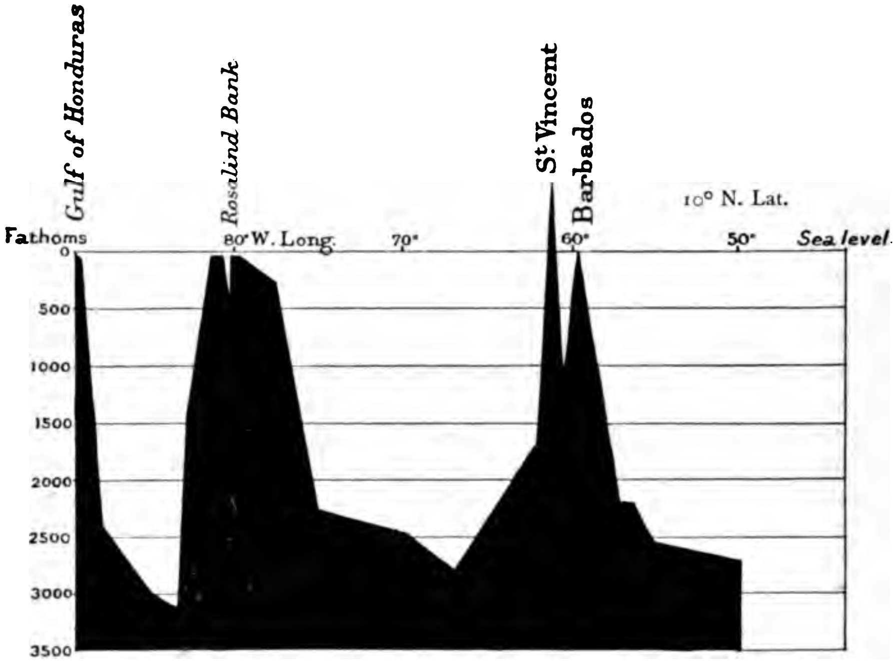
From May 11 to 17 the disturbance in both St. Vincent and Martinique moderated in violence, and partial exploration of the devastated regions became possible. In St. Vincent it was found that six distinct streams of lava flowing from La Soufrière had destroyed the villages Wallibou and Richmond. Wallibou had sunk below the sea, while Richmond, close to Wallibou, had been elevated. A ravine 100 feet deep, the source of the Rabaka river, had been filled up. At Mont Pelée it was seen that the old summit of the volcano, Morne Lacroix, was still in existence, although shattered and crumbled. A new crater, west of Morne Lacroix, was 1000 feet in diameter; another crater had opened within a mile of St. Pierre, and seven craters were at one time visible from the Fort de France. A new volcano appeared north of Pelée, close to the coast. At St. Pierre the sea had withdrawn somewhat, but it had advanced at Le Precheur. A cable ship reported that soundings in one locality had increased by about 500 fathoms, and in another it is reported that soundings had increased from 250 to 1000 fathoms. During the same period the volcano Pico de Colima, in Mexico, showed signs of activity. On May 10 Mount Redoubt, in Washington State, was reported in eruption. On May 11 a boiling lake in Dominica disappeared, hot springs in Jamaica were disturbed on May 12, and on May 13 the island of St. Thomas experienced a shock of earthquake.

On Saturday, May 17, at 8.30 p.m., La Soufrière began another violent eruption, accompanied by continuous repeated earthquakes, which were extremely local, not extending as far as Kingstown. On May 18 an earthquake affected the greater part of California, and on the same day the extinct volcano of St. Pierre de Varennes, in Morvan, France, emitted low rumbling sounds, accompanied by earth-tremors. On the 19th and 20th another eruption of Mont Pelée occurred, surpassing the earlier eruptions in violence. A "jet of fire" destroyed the village of Le Carbet, the ruins of St. Pierre left by the eruption of the 8th were destroyed, and ashes and stones descended at Fort de France.

From the scientific reports on such examination as was possible up to May 21, it appears that, except as measured by the loss of life and property, the eruptions of Mont Pelée could not rank amongst the great eruptions of history. They had brought no molten material to the surface.

Both Mont Pelée and La Soufrière continued active until May 25, when the paroxysm beginning on the 17th to 19th appears to have subsided. On the 24th a shower of "blood rain" was reported from Hamburg. This proved to be due to the presence of insects (*Carabus cocinella*), which may conceivably have been borne by upper air-currents from Martinique. On May 25 "grey snow" fell in the canton of Lucerne, Switzerland, which left a residue resembling ashes. Next day a strong earthquake was recorded at Laibach, Carniola, the chief disturbance being about 470 miles from that point.

On May 26 Mont Pelée again broke out, projecting quantities of ashes and gravel over the north of Martinique. Heavy surf beat on the shores, and an immense cloud, at a great elevation, hung over the mountain. On the same day, after a period of "unprecedented heat and drought," St. Vincent was deluged with rain. Mount Redoubt, already mentioned, ejected quantities of ashes. On the 28th, at 8.45 a.m., another violent explosion occurred at Mont Pelée, but this seems to have had no distinct counterpart at St. Vincent, as an official telegram received on the 29th says, "Volcano still erupting with varying force, but no violent outburst since May 18." La Soufrière broke out afresh, however, on the morning of May 30, and at 2 p.m. Mont Pelée suffered violent eruption, and sent forth streams of hot mud. Cable communication with St. Thomas was again interrupted on the same day. A telegram from Milan on May 30 announced disturbances on Mont Trabocchetto, in the Western Riviera. Next day it was reported that shocks of earthquake had been felt in Greece for some days previously.



Vertical scale exaggerated 400 times

SECTION SHOWING THE DEPTHS ALONG THE CENTRAL LINE OF THE CARIBBEAN SEA FROM THE GULF OF HONDURAS TO LAT. 10° N. AND LONG. 50° W., PASSING THROUGH ROSALIND AND SERRANILLA BANKS, THE NORTHERN PART OF ST. VINCENT, AND THE SOUTHERN EXTREMITY OF BARBADOS.

On June 3 a slight earthquake occurred at Velletri, 20 miles from

Rome, and on June 4 a shock was felt at Camborne, Cornwall, at 10.20 p.m. On the same day volcanic eruptions were reported from such widely separated points as Valparaiso and Baku; the former occurred in the Chaco territory, and the latter at a mud volcano in the Baku district. Sea disturbances, indicating submarine eruptions, were reported as occurring between St. Lucia and Martinique. On June 6 both La Soufrière and Mont Pelée were very active, emitting immense volumes of smoke, but apparently little solid material. Slight earthquakes were felt in South Australia. Mont Pelée erupted violently on June 7, ejecting further quantities of hot mud. Mauna Loa, in Hawaii, was reported active on the same day.

The features which stand out as specially remarkable in connection with the events described are, first, the wide distribution of seismic disturbances along certain known lines of weakness, and their occurrence *before* the greater volcanic outbursts; second, the close correspondence in *time* of the outbursts in Martinique and St. Vincent, and the apparent contrast in *type*. The St. Vincent outburst, which is probably, from the volcanologist's point of view, much the more important of the two, was accompanied by outpourings of lava, while ashes and scoriæ were blown up to a height sufficient to reach the main currents in the circulation of the upper atmosphere. At Martinique there was no "molten matter." Mont Pelée was opened and rent, but the explosions did not blow away the old summit of Morne Lacroix, nor were they of sufficient violence to prevent the formation of atmospheric vortices close to the craters. Nevertheless, as Prof. Bonney states in the note referred to above, the dust from Mont Pelée "has a general resemblance to that from the Soufrière which fell in Barbados, and both represent hypersthene-andesites."

With the second of these points it is impossible to deal further at present. The details of the eruptions will be fully studied by expeditions which have been specially despatched for the purpose, including one from this country, consisting of Dr. Tempest Anderson and Dr. J. S. Flett, whose reports will be eagerly awaited.

The first point, concerning the distribution of the seismic disturbances, is, however, important as giving a clue to the cause of the eruptions from its relation to the structure of the region. The following description is based on that given by Suess in 'Das Antlitz der Erde,' which contains by far the best summary of the literature of the subject:—

The central or principal belt of the Antilles, beginning at Cape San Antonio at the western extremity of Cuba, and including the Isle of Pines, Haiti, Porto Rico, the Virgin islands, with St. Croix, Anguilla, St. Bartholomew, Antigua, the eastern part of Guadeloupe, and part of Barbados, consists of the same rocks throughout. Granite, a species of gneiss in places, ancient eruptive rocks, the 'Blue beach' formation, some serpentines, glauconitic sandstones, and then a white limestone, probably of Cretaceous age, constitute the visible remains of a once continuous mountain chain. The same rocks are reported in the island of Trinidad, the northern chain of Venezuela, in Merida and Bogota, and finally in the whole range of the coast Cordillera in South America. A similar succession occurs in Greece, Crete, and Cyprus, in the Taurus and Armenia, in Eastern Afghanistan, and in the Andaman and Nicobar islands. Towards the west this zone splits up, by "virgation," into several branches; one extends from the peninsula of Jacmel in Haiti, through the Blue mountains of Jamaica towards Honduras; another from Cibao in Haiti, through the Sierra Maestra in Cuba to Guatemala, and thence, crossing the isthmus, reaches the great line of active volcanoes; possibly a third is represented by the Sierra de Cumanayagua in Cuba.

Outside the central belt is a zone composed solely of middle Tertiary or more recent formations. No part of this is properly mountainous; most of it flat. It attains its greatest width in the north-west, narrowing to south-east. It includes the Bahamas and the banks to the eastward as far as the Nativity bank, the islands Anegada, Sombrero, Barbuda, and part of Barbados, and to it may be added the whole of Florida, and perhaps the level part of Yucatan.

Within the central zone, *i.e.* on the concave margin of the arc, is another belt, of which only the eastern part appears at the surface, in the Lesser Antilles. It is entirely of recent volcanic origin, and includes the islands of Saba, St. Eustatius, St. Christopher, Nevis, Redonda, Montserrat, the western part of Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent, the Grenadines, and Grenada. The distribution of volcanoes corresponds to that found in the Apennines and Carpathians, along a fracture of the internal line of the arc. The Caribbean sea is thus the homologue of the Western Mediterranean basin, the Gulf of Mexico occupying much the same relation to the one as the South-Eastern Mediterranean does to the other. The vertical section (p. 57) shows the general form of the region, along a line from Guatemala, through the longer axis of the Caribbean sea, St. Vincent, and Barbados.

The facts, therefore, point to a readjustment of the remains of the fold which once formed the margin of the ancient Mediterranean, as the primary disturbance. The surviving parts of this fold are known as regions of the Earth's crust which are still subject to severe strain, and within historic times have maintained a dismal record of earthquakes; along these parts the present disturbance has made itself felt at a large number of points. In a transverse direction within the ancient fold, lines of fracture are dotted with active volcanoes, of which La Soufrière has suffered violent eruption. In the case of Mont Pelée the deep-seated disturbance appears to have been great, but the volcano seemed lacking in explosive power, which may possibly account for the many remarkable features connected with its eruption, and is interesting in view of the fact that while Mont Pelée erupted fifty years ago, La Soufrière has been quiet for ninety years. The absence of eruption at other points along the transverse line, as at St. Lucia, may help towards the interpretation of the phenomena of the eruptions when these have been more fully and accurately described, and the isolated disturbances at points apparently altogether outside the primary region may widen our knowledge of the relation of the main folds to one another.

THE VOLCANIC ERUPTION AT ST. VINCENT.

By E. ANDRÉ.

ANY one making a voyage along the Lesser Antilles cannot help being impressed with the idea that these islands are the summits of a mountain range, the lower slopes of which are covered by the sea. Between Grenada and St. Vincent, these peaks, if they may be called so, are particularly numerous, but they are of smaller size than the islands between which they lie. This chain of islands appears to be of uniform geological composition, and on all the larger ones there are evidences in the shape of craters or boiling springs of the volcanic nature of their formation. With the exception of St. Vincent, none of these islands seem to have suffered from any severe eruption since they were discovered some four hundred years ago; and to such an extent did the inhabitants of Martinique in particular consider themselves as enjoying immunity from such disturbances, that they spoke of La Montagne Pelée as an extinct volcano.

As a description of the St. Vincent eruption of 1812 has been reproduced, there is no necessity to go into details in this paper regarding the occurrence. All that need be said about it is, that it was accompanied by but little loss of life, and, so far as we can judge, was not nearly as violent as the one experienced within the last few days.

As far back as February last year the *St. Vincent Times* * "called attention to the fact that unusually heavy shocks of earthquake were felt and grumbling sounds heard by the people living at Balaine and Windsor Forest, which they attributed to the Soufrière." It is a curious fact that in October,† 1900—that is, three months and some days before these disturbances in St. Vincent—the city of Caracas and the country around suffered from considerable seismic perturbation. This fact is worth recording, because in 1812 much the same thing happened, Caracas having been destroyed on March 26, while the eruption at St. Vincent occurred on June 30. In both cases it will be observed that the disturbances in the northern mountain range of Venezuela preceded the eruptions at St. Vincent.

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* I am quoting the exact words of the *Times* of May 9.

† The heaviest shocks were felt, I understand, on the 30th, although for days before and after there had been slighter ones.

GEORGETOWN, SHOWING THICK BED OF VOLCANIC DUST COVERING THE COUNTRY.

The first intimation we at Trinidad got regarding these terrible eruptions was a telegram from Martinique announcing the destruction of the Usine Guérin, involving a loss of one hundred and fifty lives. This was on the 6th (May). On the morning of the 7th a telegram from St. Vincent reported the Soufrière to be in full eruption. On Friday afternoon I reached Kingstown, the capital of the island. I may mention that on approaching the town we noticed that the range of mountains behind was covered by dark clouds. It rained heavily, and the weather was squally. Every one was eager, so soon as we cast anchor, to get some reliable news of what had happened, but we found it impossible to obtain any accurate information. I was fortunate enough to meet Mr. Goodwin, who had just returned from the Carib country. He told me that it was impossible to give a just estimate of the loss in lives, but he was afraid that at least five hundred persons had perished. The whole district beyond Georgetown, he said, had been laid waste and was nothing but a desert of dust. Kingstown had not suffered. The greatest damage effected had been the breaking of the glass of a photographer's skylight by the small stones which fell in abundance during the eruption. Some idea may be formed of the altitude to which these small stones must have been projected when we consider that the Soufrière is 12 miles in a direct line from the town. The column of smoke which rose from the mountain has been variously estimated to have reached a height of from 10 to 20 miles, but this is conjecture only, and I mention it to show how difficult it is to obtain reliable data in matters of this kind. Mr. Wakefield, the manager of the Colonial Bank, has thus described to me what occurred at Kingstown—

"I am pretty certain the heavy detonations began at about 2·30 p.m. (Wednesday, 7th), because I remember that we were preparing to close, which we usually do at that hour, when we were alarmed by the violence of the reports exceeding anything I had ever heard before. We hurried through our work and closed the bank. Mud fell first, then pebbles and dust. The heavy detonations lasted for about an hour or an hour and a half. We had heard continuous roaring for some time before, and it roared up to late at night."

There is no doubt that the period of greatest violence of the eruption was between 2.30 and 4 on the Wednesday afternoon. People who came to Port of Spain from the northern mountain range of the island on Thursday morning reported having heard heavy firing during the previous afternoon. Mr. Griswold, one of the managers of the Asphalt Company, tells me that he was at the pitch-lake at Guanoco on the Wednesday afternoon, when he heard what he took to be the reports of heavy guns in the distance. The reports varied in strength, some being heavier than others. Guanoco is on the San Juan river to the north-west of the delta of the Orinoco, and is 260 miles from St. Vincent.

THE DRY RIVER BEYOND LANGLEY PARK, TAKEN SOME TIME BEFORE THE ERUPTION.

I tried my best to get to Georgetown on the afternoon of my arrival, but without success. I managed, however, to arrange that I should leave on the following day. As a matter of fact I did not get away from Kingstown until daybreak on the Sunday morning (11th). On

Saturday afternoon we got positive news of the destruction of St. Pierre, although, somehow or other, there had been rumours from the previous day that that town had been demolished, but as cable communication with the northern islands had been interrupted, the report did not obtain credence. Between Kingstown and Georgetown the road, which is 22 miles in length, runs for the most part along the sea where the ridges of the hills spreading from the central range are lowest. The country is undulating and very picturesque, and at one time was planted entirely in sugar-cane. Windmills and factories in ruins remain as evidences of the past prosperity of the island. The low price of sugar, joined to the frequent hurricanes which have in recent times devastated the country, have led to the cultivation of arrowroot replacing that of sugar-cane. The journey may be performed on horseback or in a carriage. I chose the latter means of transport, as I was accompanied by Mr. Jacobsen, a photographer, and he had several cameras and the accessories for taking pictures which we could not have carried with us on horseback. I noticed a thin coat of volcanic dust along the road and on the fields similar to what we had seen in Kingstown; but it was only when we got to the 15-mile post—that is, 15 miles from the capital and 7 miles from Georgetown—that the country assumed that burnt and dreary appearance which became more desolate as we neared the town. We passed numbers of people who were wandering aimlessly along the road with bundles containing all they had saved. The road in places had been cut through thick beds of lava of considerable width, showing how severe must have been the eruptions of the past. In some places the lava is smooth and uniform in texture, in others pebbles and large stones are embedded in the mass. When quite close to Georgetown we saw a large crowd on the beach. They were burying the carcass of a whale cast on shore the night before. It is not

PANORAMA OF THE SAME COUNTRY AFTER THE ERUPTION.

improbable that this whale was killed during the eruption, as quantities of dead fish have floated ashore at St. Pierre and other ports.

The road from the 15-mile post to within a short distance of Georgetown was littered with stones, but in the town itself we saw no such stones, the streets and yards being covered to a depth of from 18 inches to 3 feet with dust. In appearance this dust is just like cement. In fact, the whole country looks as if millions of barrels of cement had been emptied over it. By digging into this layer of dust a layer of stones of various sizes is reached, and this bears out the statement of the people that a shower of stones preceded the falling of the ashes, as they call the volcanic dust with which the country is covered. Twelve of these stones picked up at random weighed together 3 lbs. 4 ozs.; the largest measured in circumference 13 inches by 11, and weighed 11 ozs. The smallest was $4\frac{1}{2}$ by 6 inches. One piece I obtained was particularly heavy, but it was not pure lava; it was a piece of trap-rock with some lava fused on to it. There is one circumstance worth mentioning connected with the falling of these stones. The glass windows of the houses on the side facing the sea had suffered even more severely than those opposite to the volcano; so that the stones which broke them must have been projected a considerable distance beyond the town, and then blown back either by the strong easterly wind prevailing in this region, or by the gusts which the people say rushed back towards the mountain after each explosion.

APPEARANCE OF THE COUNTRY (ST. VINCENT) AFTER THE ERUPTION.

Just beyond Georgetown is Mount Bentinck Estate. Langley Park adjoins Mount Bentinck, and is certainly not a mile away from the town, yet while thirty-seven people were killed in the overseer's house on this estate no one was injured in Georgetown. The greatest number of deaths occurred at Rabaka, Lot 14, Waterloo Orange Hill, Terema, and Overland. All these places appear to have suffered terribly. The Dry river, a wide mountain torrent some 20 feet in depth, was entirely filled up with dust, or with lava and dust, so that we were able to drive over it; and I would never have suspected that so great a change could have been effected in the appearance of a considerable tract of country in so short a time had I not seen photographs of the district before the eruption. I am under the impression that a stream of lava must have flowed down the bed of the Dry river, and that it has been covered over by a thick layer of dust, for whereas everywhere else the dust is firm, I noticed vent-holes between what were pointed out to me as having been the high banks of this mountain torrent. Out of these vent-holes steam was being forced with violence, and Jacobson, who had put his hand close to one of them, got his fingers severely burnt. Between Mount Bentinck Estate and Overland, a distance of some 3 miles along the coast and from a mile to a mile and a half inland, I do not suppose that less than from 1500 to 2000 persons have perished, although the district is not by any means a thickly peopled one. The distance between the crater and the places where most people were found dead is between 4 and 5 miles in a straight line. A careful study of the map affords the best clue to what happened on that eventful Wednesday afternoon, when Georgetown escaped without casualty, while places barely a mile distant lost all their inhabitants. For want of a better explanation I suppose that this line of demarcation between life and death might be called vagaries of a volcanic eruption, whereas what had taken place is exactly what might have been expected under the circumstances.

ST. PIERRE, MARTINIQUE, BEFORE THE ERUPTION.

The mountain range forming the backbone of St. Vincent runs from south to north, and culminates in a peak beyond the crater, which reaches an altitude of 4048 feet. Beyond this peak the land slopes in every direction until it meets the sea. The irregular range in which this peak is situate may have been the ruin of a crater of much vaster dimensions than that which now constitutes the funnel of the Soufrière. Besides the concentric nature of the northern range, it is to be remarked that the valleys which it hems in on the north open out towards the east on one side and the west on the other, and it is along these valleys that the greatest amount of damage appears to have been done. We can imagine that vents having been formed in the sides of the crater offering the least resistance, these valleys were within the zone of fire, if a military term may be employed to express what has occurred. The several ridges running north and north-east in the vicinity of Mount Brisbane would have to a certain extent protected Georgetown and the country to the south. Perhaps the most difficult of the problems connected with the eruption is to explain how so many people were killed in what must have been, if I have been correctly informed, an exceedingly short space of time. If it be a fact that the explosions were succeeded by strong draughts of air rushing towards the mountain, it may be inferred that they produced some of a vacuum. May it not be that the shock of these explosions was sufficient to produce death? Might not heated air, hot dust, or superheated steam have been responsible for many casualties? From the injuries of the victims in the hospitals, I

ST. PIERRE AFTER THE ERUPTION.

should say that a large proportion of the fatalities was caused by the pieces of red-hot lava which were hurled with violence through the air during the explosions. Although a continuous thunderstorm accompanied the eruption, I do not believe that lightning occasioned any loss of life worth mentioning.

One of the theories promulgated by a scientific man in a local paper with reference to the Martinique disaster, which seems to have gained general credence, is that burning marsh gas was blown out of the mountain side over the town of St. Pierre, and that those not destroyed by the burning gas perished in the resulting cloud of carbon dioxide which settled over the town for some time after. Now, I cannot help thinking from what I have seen, that what took place at St. Pierre is much the same as what occurred in the Carib country. Had there been an important town anywhere between Rabaka and Turema, I have no doubt that its inhabitants would have been wiped out as effectually as at St. Pierre; yet I cannot help believing that carbon dioxide had but little to do with the loss of life at St. Vincent. I shall cite one case which I think renders the carbon-dioxide theory untenable. Mr. Beach, the manager of Fancy, told me that he and another gentleman shut themselves up in the cellar of the estate building when the violent explosions began. During a lull he went out and brought in ten men very much burnt and injured. They died subsequently. Had carbon dioxide settled over the country, would it have been possible for Mr. Beach, during a lull between the explosions, to have brought in the injured men? Would not the cellar have been invaded by this heavy gas, rendering return to it impossible? At St. Pierre, curiously enough, one of the few persons who escaped death was a prisoner shut up in one of the lowest dungeons.

That burning lava, in the shape of stones of various sizes, was projected out of the sides of the mountain along the valleys cannot possibly be doubted. Many of the dead and dying animals I examined were scored along their sides, not vertically, as would have been the case had there been a shower of red-hot stones alone. Clothing seems to have offered some sort of protection to those who were injured. In almost every case the exposed face and hands and naked feet of the victims had suffered more than other parts of their bodies. Some were terribly burnt, the bones of the hands and ankles being exposed. For them, of course, there was no hope. Even in cases where the burns did not appear serious, one of the doctors told me that he did not expect to save one in ten. "I have had so many cases on my hands," he said, "that I have been unable to make any *post-mortem* examination. They all appear to suffer from the lungs, and they die very often when you least expect it. In most cases they were only brought in a day or two after they had been injured, and during that time they had remained without water or food, so that treating them with success is next to impossible."

All the time that we were at Georgetown heavy clouds of smoke enveloped the Soufrière, so that it was impossible to get a view of the mountain. To arrive at a correct idea of the changes which may have taken place in its configuration, and in that of the country to leeward, would entail a survey extending over weeks, perhaps over months. That the soundings along the coast, and even at distances from the land, will be found to have changed, even to a considerable extent, I have no doubt, but that is work requiring some time to perform. All that this paper aims at is to give an idea of the eruption and its effects, as seen by one who paid a hurried visit to St. Vincent, and was the first to reach the scene of the catastrophe, as these forces of Nature which take no account of the creatures affected by them are called.

Port of Spain, Trinidad, May 22.

LIEUT. RHOADES' SURVEY OF LAKE NYASA.*

A FEW years ago (December, 1898) we published, as will be remembered, a map of Lake Nyasa, based on the careful and accurate survey of its coast-lines by Lieut. Rhoades, R.N.R., carried out entirely at his own expense, which was a decided advance on all previous maps of the lake. That officer has since continued his survey by the execution of an extensive series of soundings, the results of which are embodied in the map given in the present number. It will be seen that the number of soundings is very considerable, and that contours can now be drawn indicating, in a satisfactory way, the general conformation of the lake-bottom. As might have been expected, and as indeed it had been possible to conclude from the material we before possessed, the depths vary more or less in accordance with the steepness of the coast-lines, being greatest in those parts of the rift-valley where the sides take most markedly the character of fault-scarps, and where the original conformation of the valley, as the result of the crust-movements to which it owes its origin, is presumably the best preserved.

The broad agreement between the valley slopes above and below the present water-level is shown by the sections at the side of the map, although these must be taken as indicating in a general way only the actual contour of the lake-bottom, being in some cases deduced, in part at least, from the estimated position of the contour-lines on the map, and not from actual lines of soundings at the several latitudes. One or two of the sections, especially the most northerly (that in 10° N. lat.), show at first sight a somewhat surprising steepness of slope below water as compared with that above. Too much must not, however, be built upon this, as it seems probable that the rise of the shores may be in some cases more abrupt than is shown by Lieut. Rhoades, who can hardly have had at his disposal data for the delineation of the above-water slopes with minute accuracy. Bornhardt's map (*Verdhandlungen* of the Berlin Geographical Society, 1899, No. 10) shows, *e.g.*, in 10° S. lat., a ridge some 3500 feet above the lake-surface, at a distance of only 3 miles from its shore, which would give an angle of slope comparable to that found by Lieut. Rhoades below the surface; while somewhat further north, the coast range rises 6000 feet above the lake within about the same distance. The fairly level character of the lake-bottom over large areas, especially in the northern part of the lake, when once the base of the steep slope is reached, is well brought out by the soundings. At the constricted neck between Deep bay and Wied Hafen, the greatest variation in depth found over a space measuring some 13 miles each way was, *e.g.*, only 11 fathoms, though greater may no doubt exist.

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* Map, p. 136.

It will be noticed that no sounding gave a depth equal to that found by Mr. J. E. S. Moore (430 fathoms), the maximum obtained being 386; and also that this occurred somewhat to the north of Mr. Moore's maximum. An indication of another deep basin near the position of the latter's sounding is, however, given by the small isolated area with a depth greater than 300 fathoms; but any greater depths than those found by Lieut. Rhoades must necessarily be of the nature of a narrow trough or depression of limited area. Dr. Fülleborn's sounding of 180 fathoms in 11° 39'·5 S., 34° 40' E. (*Journal*, vol. xvi. p. 561) agrees well with Lieut. Rhoades' results.

The value of the new survey is enhanced by the record which was made of the nature of the bottom at the position of each sounding, an indication of which is given on the map. It will be seen that in the great majority of cases the bottom is mud, as was found to be the case by Dr. Fülleborn. Lieut. Rhoades did not apparently light upon any case of a clean rocky bottom off the Livingstone range, such as was found by Mr. Moore. Specimens of the bottom deposits were brought to this country, and have since been analyzed, the report by the expert to whom they were submitted being printed below.

APPENDIX.

REPORT ON SPECIMENS OF MUD, ETC., FROM THE BOTTOM OF LAKE NYASA, OBTAINED BY LIEUT. E. L. RHOADES DURING SOUNDING OPERATIONS IN 1900 AND 1901.

1. Light brown mud from 386 fathoms, 10 miles east of Sisia. Consists mainly of minute fragments of quartz and felspar (including microcline), mica (muscovite), and a little pleochroic (green to yellow) hornblende, such as might be derived from ancient gneisses and schists, together with a little organic matter and remains of

diatoms. The latter appear to belong mainly to Melosira (*Gallionella*, Ehrenberg), and probably to a fresh-water species, but it would be advisable to have the diatoms in these muds determined by an expert, as the fact of their being fresh-water or marine species may have some bearing upon the question of the origin of the East African lakes.

2. Light brown mud from 227 fathoms, off Mount Gramfra (?). Similar to the above, but containing fewer remains of diatoms; some strongly refractive and doubly refractive grains, with straight extinction, consist probably of zircon.

3. Light greenish-grey mud from 215 fathoms, Bandawe, north-east. Contains so much bituminous matter that it will burn with flame; fewer quartz grains, but a few diatom remains like those in 1 and 2.

4. Off Rifu, 60 fathoms. Consists of grains of pisolitic ironstone, or bog-ore (Bohnerz), embedded in a peculiar milk-white, waxy-looking substance. The latter is of interest, as it consists of oxide of zinc and organic matter, and is probably an organic salt of zinc.* A larger supply of this material for further examination is desirable.

(Signed) G. T. PRIOR,
Mineral Department,
November 14, 1901.

A JOURNEY FROM QUETTA TO MESHED VIÂ THE NUSHKI-SISTAN TRADE-ROUTE.†

I.

By the **EARL OF RONALDSHAY.**

WITH a view to travelling over the recently opened trade-route between India and Persia, across Baluchistan, I journeyed to Quetta at the end of October, 1900, reaching that place on November 1. Here I spent ten days making final preparations, and engaged the servants I required to accompany me as far as Meshed. These consisted of seven Indian servants, and a daffidar and three sowars of the local levy from Nushki, as an escort. By the 9th all was ready, and I started my caravan of baggage camels, and left Quetta myself on the 10th.

After leaving the main road a few miles from the town, the route becomes a camel track, running over flat stretches of sand and gravel, covered for the most part with brown tufts of aromatic wormwood, while low ridges of barren hills shut in the view on either side. Here and there small villages are to be found, more clumps of low flat-roofed mud huts, whose existence must inevitably come to an untimely end should the country ever be visited by anything like prolonged rain. Sixteen miles beyond Quetta we passed the first of the levy posts, Girdi Talab, and another 16 miles brought us to the second, Karnak, where we camped for the night. These levy posts consist of small mud forts, which exist, or are in process of construction, at intervals of from 15 to 30 miles the whole way from Quetta to Sistan, and are held by a daffidar and a few sowars raised locally, who carry a mail bag from post to post, thus maintaining the only communication that exists between Sistan and Quetta, a distance of upwards of 500 miles over the deserted wastes of Baluchistan.

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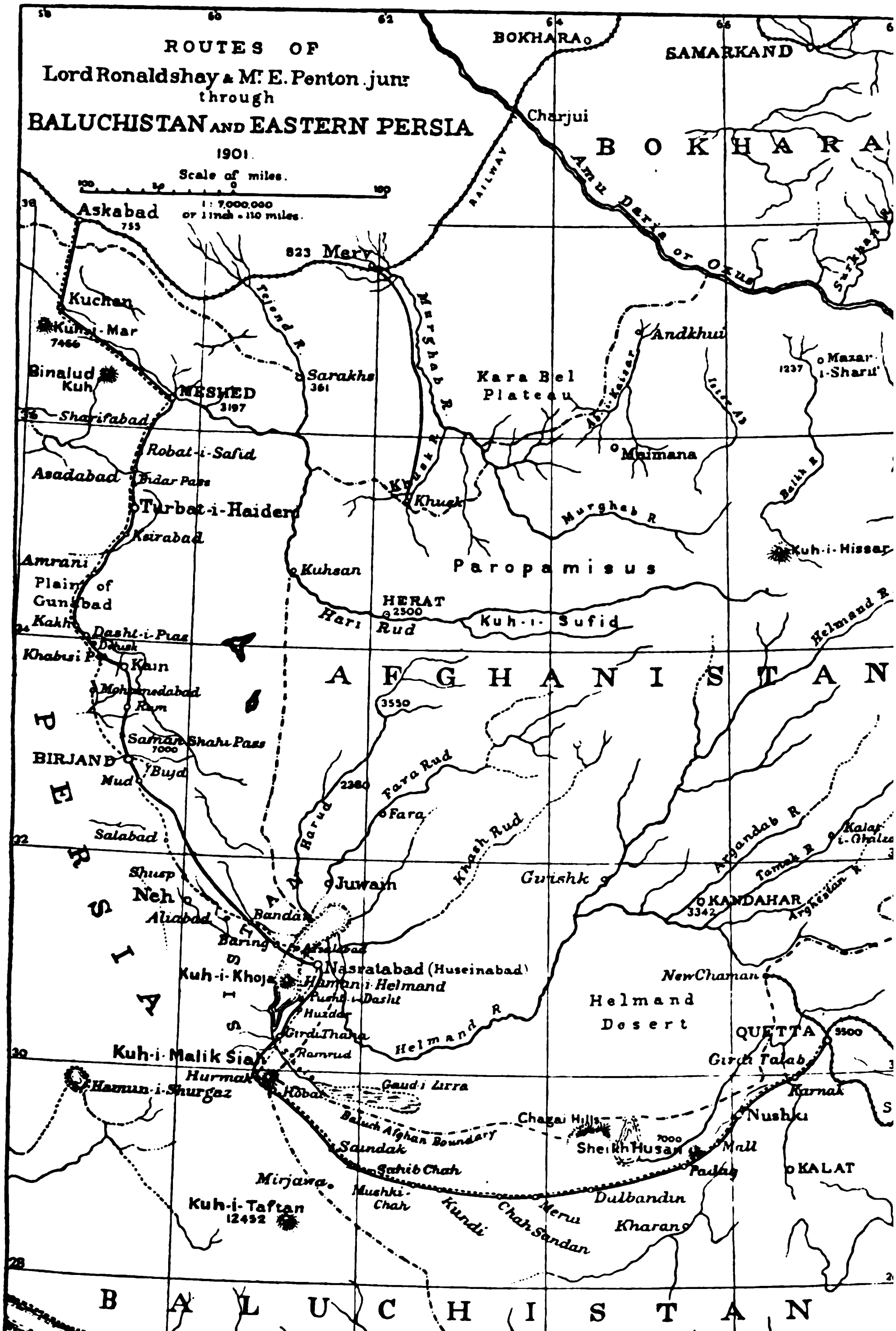
* Lieut. Rhoades states that the zinc came from the white zinc at the bottom of the sounding instrument, not from the deposit brought up.

† Read at the Royal Geographical Society, April 28, 1902.



Lord Ronaldshay's Route ——— *Mr Penton's Route* -------- *Boundaries* - - - - -

Heights in feet

Published by the Royal Geographical Society

On the 13th we reached the edge of the plateau, across which the track had taken us for some 90 miles, and descended somewhat abruptly to the plain on which Nushki stands. A little further on we came in sight of Nushki itself. It appeared to be little more than a glorified edition of all the other villages we had seen, the same one-storey mud-houses, though with something more like method displayed in the ground plan. A broad street led through the centre, faced at the far end by a large rectangular building, also of mud, which contained the police lines, the levy lines, and the post-office. A short way from the main street, and clear of the town, stands a hospital, and beyond this again a caravanserai for the use of kafilahs, and these, with about 120 shops, go to make the town of Nushki, which, all told, probably consists of about 200 houses. The population is at present hardly in proportion to the size of the town, as I was informed that it was at this time about 250 people; but the place is young, the land having been but lately acquired by Government, and, considering that three or four years ago there was nothing, the progress made must be considered fair. Along one side of the town flows a small stream, the Kaiser, which forms the water-supply of the place, and growing on it banks were to be seen about a dozen trees, scattered here and there in clumps of two and three, looking quaintly out of place amid the surrounding chaos of sand and stone. Passing through the town, we emerged on the far side to find camp pitched at the foot of a small hill.

The future growth and prosperity of Nushki must depend upon whether it or Quetta is to be the starting-point of caravans to cross the desolate stretches which lie between it and Sistan. At present Kafilahs make it a halting-place, as they have perforce to go on to Quetta; but it appeared to me as I came along that a line from Quetta would be by no means an impossible undertaking, and in the event of such a line being constructed, Nushki would undoubtedly become a large and flourishing place. Whether the water-supply would under such altered circumstances be equal to the demand is another matter. That Nushki is a far more suitable starting-point and terminus to the caravan route than Quetta, must be perfectly obvious to any one who has seen the two places; the large open stretches round Nushki, capable of affording ample grazing for any number of camels, being wanting at Quetta; while standing as it does on the plain, at the same level practically as the whole of the route to Sistan, the ascent of over 2000 feet to the Quetta plateau, most unsuitable to camel transport, is obviated. Since I was there, sanction has been given for a survey to be made with a view to building a railway from Quetta, so that we may hope before long to see Nushki constituted the terminus of the caravan route.

I left Nushki on the 15th, and marched south-west over a perfectly flat plain to the foot of Sheikh Husan, whose jet-black sides rise from the plain to a height of 7000 feet above sea-level. From here the road, which, thanks to the energy of Captain Webb Ware, the officer in charge of the route, was in most places clearly distinguishable from the rest of the plain, ran close under the Kharan mountains, while to the north stretched miles of sand covered with stunted tamarisk, and broken here and there in the far distance by low hills.

A distance of about 110 miles brought us to the post of Dalbandin, which may be described as the end of the first section of the road from Nushki. It differs little from other posts along the road, except that a bungalow for travellers has been erected, and the fort, which is a large one, contains a post-office. The water is good, and is brought by a "karez" from the Chagai hills on the north.

From Dalbandin the road led at times through ground broken by low ridges and mounds, at others over great plains of black gravel where vegetation all but ceased, and then again over stretches of sand where tamarisk and dwarf palm grew.

At the next well, 30 miles on, I found the water brackish; but good water was again reached at Merui, 50 miles from Dalbandin, where the second post-office from Nushki is situated. From Merui the track lay through much the same sort of country, running at times between low ridges of barren hills and across broad dips, having the appearance of long-dried-up river-beds, where tamarisk and dwarf palm flourished; at others over vast plains where vegetation ceased, and nothing was to be seen but huge expanses of black gravel and rock, parched and shimmering in the sun.

On the 29th we reached the post known as Chah Sandan, distant from Quetta 276 miles, and halted for a day to rest the camels. The road thus far, as will have been gathered, is a sufficiently dreary one, and little in the way of human life is to be met with; an occasional kafilah travelling at slow, monotonous pace towards Quetta, and sometimes a small company of men on camels or on foot marching in the same direction as myself, the latter, pilgrims for the most part, on their way to the holy city of Meshed. At one post I had met a kafilah of about thirty camels from Sistan; at another was a larger kafilah of Pathans, who had come from Herat through Sistan with loads of dried fruit and other merchandise, and were on their way to Quetta; at Dalbandin there was a dealer with a string of horses, and shortly before reaching Merui I had come across a kafilah of from fifty to sixty camels from Sistan, also travelling east.

AN OASIS IN THE DESERT, BALUCHISTAN.

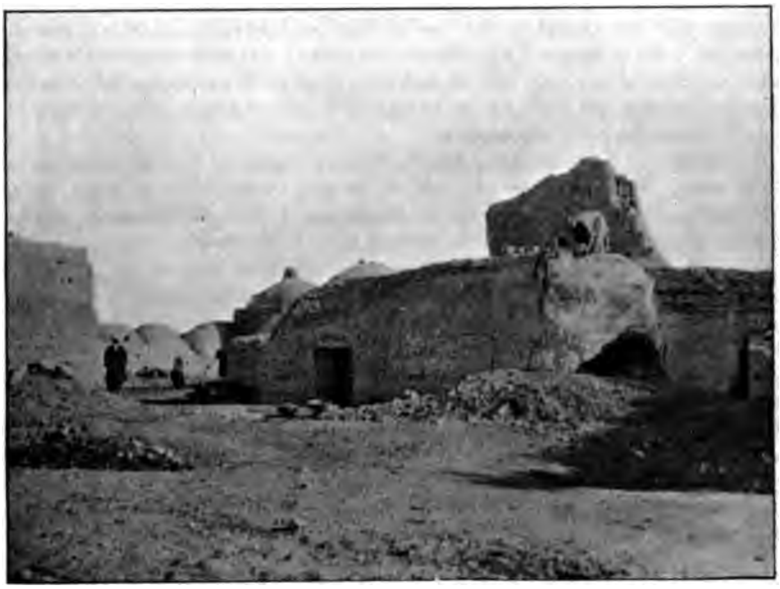
From Chah Sandan the road lay across a vast plain of black gravel, with a horizon on the south and west like the sea, but broken on the north by rocky hills. Vegetation there was none, but here and there curious excrescences of sand caught the eye—low rounded mounds, sometimes in irregular patches, but more often in regular lines, looking from afar like chains of entrenchments stretching across the plain. Beyond this nothing but miles and miles of black gravel, the dreary monotony of which was enhanced by a leaden sky overhead. As we got further west, ranges of mountains began to show themselves in front of us, and conspicuous among them soon became visible the glittering snow-clad peak of the Kuh-i-Taftan, which rises in Persian Baluchistan to a height of 12,452 feet. A post at the foot of the Saindak mountains was reached on December 6, whence three days' march in a north-westerly direction brought us to Robat, on the Perso-Baluch border, on the edge of the Kuh-i-Malik-Siah, distant from Quetta 460 miles.

From Robat the road takes a fairly level course through the Kuh-i-Malik Siah, keeping just on the Persian side of the Perso-Afghan boundary, and running now due north. Occasionally glimpses of the real desert to the east could be seen through openings in the hills; but otherwise there was little of interest, and an uneventful march of 17 miles brought us to camp, pitched on the edge of a large patch of tamarisk jungle, and close to some springs of excellent water. As we continued our journey northward, the Kuh-i-Malik Siah faded away behind us, and we were marching once more across an absolute level. Fifty miles from Robat we came to Girdi Thana, a small post recently constructed under the direction of Major Chenevix Trench, at that time Consul at Sistan. From here, dotted all over the plain, are to be seen the remains of ancient cities, all deserted and fallen into decay. I visited one within a couple of miles of camp, and found walls and the lower parts of houses standing, but the whole had the appearance of having been long deserted, owing to the domes of the houses having all fallen in, and to great drifts of sand having been blown against the walls. From the latter I could see with my glasses any number of similar ruins, dotted over the plain in every direction, some of which have, I believe, been deserted for many years. My escort told me that the villages all round had been deserted for over 200 years; but, though some have undoubtedly been deserted as long or longer, I have good reason to believe that the majority were left by the inhabitants owing to changes in the course of the Helmand depriving them of their water-supply about thirty-five years ago. The early history of many must date back for centuries, for coins and seals of Greek and Assyrian times are dug up by the natives, and legend credits them with being the birthplace of Rustam, greatest hero of Persian myth.

About 30 miles on I reached the fringe of an inhabited country again, and when within 20 miles of Nasratabad, the capital of Sistan, was met by a number of mules sent by the Amir of Sistan to help me over the remainder of my journey—a kindness which I greatly appreciated when I saw what kind of a road it was that led up to the chief town in Sistan, and still more when I learned that his own private mules were the only ones in the country. The whole face of the country changed these last 20 miles; instead of a dry waterless plain, it became a plain intersected with ditches and canals, and covered with low scrub jungle and with pools of water, making travelling anything but pleasant, for, with the exception of one or two lately made by Major Trench, the recently appointed British Consul for Sistan, there were no bridges, and, the canals being often deep, wettings were unpleasantly frequent. Villages were scattered about over the plain, differing little from the ruined specimens I had already seen, with the exception of being inhabited. These last 20 miles covered, I found myself at the capital. My journey was for the time being at an end, and I looked forward with pleasure to a rest in Sistan and the companionship of a fellow-countryman after many days of solitary wandering over the stony wastes of inhospitable Baluchistan.

I have endeavoured to show that the journey from Quetta can, thanks to the admirable way in which Captain Webb Ware, the officer in charge of the route, has carried out his duties, be performed with ease and with comparative comfort; that supplies are forthcoming at all the larger posts; and that water and grazing exist for camels at every stage.

The climate is in the winter as a rule fine and dry, cold at nights and in the early mornings, with a warm sun in the middle of the day, and it is in winter that caravans at present travel over it; but I am assured by those who ought to know, that though the heat in the daytime is very considerable, there is no reason why caravans (who prefer travelling by night when feasible) should not find the route in every respect as satisfactory a one in summer as in winter. The total rainfall is very small, and for some years has not averaged more than a few inches, which makes cultivation impossible except in selected places in the vicinity of the mountains, where artificial irrigation is possible by means of karezes. As far as Dalbandin there should be no difficulty about supplies, even when traffic becomes far greater than it is at present, as local cultivation should be possible on this section; but from Dalbandin to the Saindak mountains cultivation would hardly be possible, and supplies would have to be brought from Nushki and the Nushki-Dalbandin section, and for the latter half of this section from Mirjawa and the country round it on the Persian border. With so fertile a country as Sistan within a few days' march, no anxiety need be felt on account of supplies for the remainder of the journey.



TYPICAL HOUSES IN NASRATABAD, THE CAPITAL OF SISTAN, EASTERN PERSIA.

Having reached, after many days of marching across such arid wastes as I have described, the capital of little-known Sistan, one's first impression is that there is little to see and still less to rouse one's interest in the tumble-down, dilapidated mud city, which has the appearance of having been dropped down haphazard in the middle of a vast and cheerless plain. The entire absence of roads, the untidy and neglected appearance of Huseinabad, the southern town through which one rides on entering the capital from the south, the narrow winding lanes which serve for streets, and the total want of method displayed in the arrangement of the low, domed houses which stand together in irregular clumps, all tend to produce a feeling of disappointment on one's first glimpse of the capital.

The two parts of the town are known locally as Huseinabad and Nasratabad. Beyond these have lately sprung up the neat buildings of the British consulate. Huseinabad, as I have already mentioned, is little more than a collection of small domed mud houses, built irrespective of ground-plan, wheresoever fancy dictated, in the middle of a vast plain. Nasratabad, the northern half, though little to boast of, is by far the most imposing of the two, being enclosed by high walls about 350 yards in length from north to south, and 400 yards from east to west, with buttresses at intervals of about 40 yards. In the centre of the southern wall stands one of the two gateways of the city, supported on each side by a buttress, and from here the central street runs the length of the city, terminating in a similar gateway in the centre of the north wall.

By far the most imposing of the shops in the bazaar stands midway between the south and north gates, and is presided over by one Seth Suleiman, an Indian merchant, who left Quetta at the end of 1899 with a capital of 20,000 rupees to exploit the trade of Sistan. His venture had already met with considerable success, and at the time of my visit he was making a large profit on his capital, which, he informed me, was not nearly large enough to admit of his carrying on the whole trade of which the place was capable.

In addition to Nasratabad and Huseinabad, there remains the more modern part of the town. Separated from the rest of the city by a *maidan* of some acres, it occupies an admirable site, and has the advantage of room for extension, should it at any time be thought advisable to embark upon enlargement.

Such was the city I found in 1900. The day after my arrival, I called on M. Miller, the Russian Vice-consul, and later in the afternoon paid a visit in state to the Amir, who rejoices in the title of Hashmat-ul-Mulk, or Glory of the Country. His reception hall was large for Sistan, and might have been 18 or 20 feet in length by perhaps 10 or 12 in breadth. The only ornamentation on the walls was a dado of cretonne, and on the table was a cloth of bright yellow cotton, with a deep border of gaudy red roses. Overhead could be seen the funnel of a bad-gir, or air-shaft, for catching the wind in the hot weather.

Conversation with the ruler, who is a man of medium height with no great claim to any very impressive presence, was confined for the most part to generalities, though he spoke with the greatest assurance of the advantage of a line from Quetta to Robat, which he looked upon as a certain production of the near future; indeed, I heard the advent of a line along the new trade-route discussed with much more certainty by the higher-class Sistanis, who look upon the question of its ultimate construction as in no way open to doubt, than I did at the Quetta-Nushki end of the route.

The people of next importance after the Amir are his two sons, with the titles of the Sartip and the Sarhang, both of whom I visited. Though of the same age, they are of very different character, the temperate life and habits and strength of character of the Sartip contrasting more than favourably with the intemperance and weakness of the Sarhang.

Though the merchandise which comes along the route from India eventually finds its way to many places far beyond Sistan, the actual trade-route, known as the Nushki-Sistan trade-route, lies between Quetta and Nasratabad, and consists of the track which I have already described. If we may judge by progress in the past, the future prospects of the route are decidedly bright. The amount of trade which passed over the route the first year that it was taken up was a lakh and a half. Since that time—1896—the trade has been steadily increasing, and shows returns for the years 1897 to 1901 of 5 lakhs, 7 lakhs, 12 lakhs, and 15 lakhs. At Quetta a caravanserai has been built near the station, and placed under the superintendence of a trustworthy native, for the use of traders coming from Persia, and a rebate of one-third is given on the railway freight of certain goods exported from, and all goods imported into, India through Quetta and Nushki.

There is every reason, therefore, to suppose that if the ultimate construction of a railway depends solely upon the increase of trade, such a railway may be looked for in the not very distant future.

If I found no difficulty in getting to Sistan, I found that getting away again was quite a different matter. The only form of transport in the country was camels, the few mules there are being the private property of the Amir, and the only camel-man who was willing to proceed in a northern direction was a sulky and vacillating Birjandi, who could in nowise understand why the "feringhi" should be in such a break-neck hurry, the passing of time being an unconsidered quantity in his oriental conception of life. It was, consequently, the middle of January before I finally got under way again.

THE MAIN STREET OF NUSHKI.

For the first few miles we travelled over the rich alluvial soil of Sistan, until we reached the Naizar, which, on this occasion, presented no difficulty to the traveller, having assumed the form which it usually does, I believe, at this time of year, of a dry and easily traversable cane-brake.

Once over the Naizar, we entered a country once more resembling very strongly the dry and arid wastes of Baluchistan, where vegetation and cultivation were only to be found at the scattered villages, where, under the influence of artificial irrigation, a certain amount of verdure was to be seen in the form of crops and trees.

Thus we travelled, daily crossing dry and dusty plains, surrounded on all sides by bleak and barren hills, which in their turn had to be crossed when they barred our way, revealing from their summits only a succession of further plains such as we had already left behind. On one or two occasions we found ourselves marching through a covering of snow; but this was not of sufficient depth to delay us much, and at the end of January we reached Birjand.

Owing to the uneven nature of the ground on which the town is built, one sees but a small portion of it from the plain over which one rides when approaching from the east, and it is not until one has climbed one of the many low, irregular-shaped hills which surround it, and looked down on it from above, that one can claim to have seen the city in its entirety. From such a point of vantage, one sees spread out before one a stretch of hilly ground thickly covered with a mass of irregular domed houses, with here and there an edifice larger than the rest, standing out conspicuous with upper story and bald, flat roof, usually the residence of some servant or retainer of the Amir. At the south-east corner stands the old fort, and at the north-west corner, dominating a broad thoroughfare which runs crescent-wise from west to east, the *new fort*—a building which, however, would appear to have very little valid claim to either title, consisting, as it does at the present time, of decayed mud walls enclosing the remains of what might once have been houses.

From conversation with various people, I gathered that Birjand was a great trading centre, and that, besides one large and several smaller madressehs or schools, there were six or seven large *serais* for the accommodation of the kafilahs which were perpetually coming and going. The population was generally agreed to be about 30,000, which points to the increased prosperity of the town of late years, for in 1890 it is spoken of as a town of about 14,000 inhabitants, while Colonel Yate, when visiting the place in 1894, put down the population at 25,000. The chief water-supply of the place is brought from the hills by a kanat; but this is hard and brackish, and for drinking purposes rain-water is caught and preserved in large tanks.

Before leaving I was granted an audience by Mir Ismail Khan, Shaukat-ul-Mulk, Amir of Kain.

Formerly one Mir Alam Khan ruled with a powerful hand over the whole of the possessions now divided between his two sons, the elder of whom now reigns in Sistan as Hashmat-ul-Mulk, while the province of Kain was given to the younger, Mir Ismail Khan, with the title of Shaukat-ul-Mulk.

The Amir, a stout man of medium height, resembles his brother the Hashmat-ul-Mulk. Like all the nobility of Birjand, whose code of philosophy seems to be of the kind which teaches them to "live to eat" rather than to "eat to live," he drinks a great deal and is an inveterate opium-smoker. He seems to be favourably inclined towards the English, but refused to be led into making any compromising statement of his opinions. When I asked him about his army, he said that the Shah paid for two regiments; "but," he added, with oriental grandiloquence, "all my people are soldiers, and I could at any moment summon to arms fifty or sixty thousand men." Such an army of his people would indeed be a mob worth seeing. On leaving, I found half a dozen men in untidy red uniforms drawn up in line, looking for all the world like a row of little tin soldiers.

The impression which I received of the Amir was of a man far less influenced by contact with European ideas than his brother, and of a potentate who thought much of the advice, "Let us eat, drink, and be merry, for to-morrow we die." At the same time he takes an interest in modern inventions, and at this time he was suffering from a damaged thumb, the result, he informed me, of experimenting with firearms. I have reason to believe that he is in high favour with the central government at Tehran, a position which he is successful in maintaining by means of large annual gifts, in confirmation of which he showed me an autograph letter from the Shah, thanking him in most flowery language for presents lately received.

Leaving Birjand on February 4, we travelled in a northern direction over a flat expanse bounded by a range of mountains, from which long lines of kanat shafts stretched away in various directions, carrying water to the villages which were dotted here and there over the country. Much of the land was being ploughed, and it is possible that there are times of the year when the terrible monotony of the uniform dust colour of Birjand is broken by fields of smiling corn, and the blossom of the many kinds of fruit said to grow there.

On the 5th we crossed the range in front of us by the Saman Shahi pass, 7000 feet, where snow lay deep on the ground. Having seen my camels safely over the summit, I went on ahead with a small escort, passing here and there small villages and little plots of cultivated land. Evening began to close in, bringing with it no signs of Rum, the village at which I purposed camping for the night, and I took the first opportunity afforded by a small clump of domed houses of inquiring how much further it was. In reply, I was informed that it was at present about 12 miles off, but that if I continued in my present direction, it would soon be a good deal further. This was a little disconcerting, as I had followed the only visible track; but, following the directions of my informant, I was lucky enough to regain the *road*, and reach a village with a good serai by evening. None of my camels turned up that night, and when they at last reached me the following day, the men told me that they too had got off the line, which will give a very fair idea of what a Persian *road* is like.

A "THANA" OR FORT IN NORTHERN BALUCHISTAN.

From here on to Meshed we travelled over a succession of scorched and desolate plains, intersected by ranges of barren hills, running for the most part in parallel lines from east to west, and rising to greater heights as we got further north. Though there is nothing like the accommodation for travellers between Birjand and Meshed, which exists on the more travelled routes where the system of post-riding is in vogue, yet I found at most villages a building of some sort put aside for the use of caravans, and though these consisted for the most part of miserable mud hovels, ill-kept and dirty in the extreme, I made use of them, as a rule, to save the time invariably wasted when tents had to be pitched and struck.

Some few of the villages on the route rise superior to the majority in size and accommodation, and these should, I suppose, be dignified by the term town. The first of these which I came to was Kain, a town of about a thousand inhabitants, surrounded by large orchards of fruit trees. At the present time Kain is noted for the large amount of saffron which it grows, and which has taken the place as an export of the silk for which the place was formerly famous. Three days' journey beyond Kain is situated the town of Kakh, nestling among clumps of trees at the foot of a mountain range. On the outskirts of the town stands a large building surmounted by a fine dome of enamelled bricks of yellow and light and dark blue, beneath which lie the remains of one Sultan Mohammed, brother of Iman Reza, the saint whose remains invest Meshed with such a degree of sanctity. The town also boasts of a fair bazaar, in which a certain amount of goods of European manufacture can be bought, supplied at present by the stream of goods that flows in from Russia on the north.

A short march beyond Kakh, a large and fertile oasis, comprised of a number of villages and cultivated fields under the general name of Gunabad, relieves the eye after the terrible monotony of the greater part of the country; but beyond this again stretches a vast and inhospitable plain. The landscape here was one such as is common in Khorasan and Baluchistan, consisting of a vast expanse of level with a vision of hills in the dim distance beyond. Overhead the sun shone from a cloudless sky, but during the day a strong wind blew in fitful gusts, raising a whole host of sand-devils that spun in wild gyrations over the dreary waste. Mirage, too, dazzling the eye and bewildering the senses with its elusive and incessant tremor, produced for our edification some of its most fantastic illusions.

Two days' journey across this sterile expanse, and a third through more mountainous country, brought me to Turbat-i-Haideri, whence a toilsome journey of some 80 miles across mountain ridges covered with ice and snow took me to the holy city of Meshed and the end of my caravan journey.

II.

By EDWARD PENTON.

In following the paper that has just been read by Lord Ronaldshay, and submitting a few of my own experiences on the same journey, my observations will naturally be based on the difference of the seasons during which our respective journeys were made. Whereas he left Quetta October 10, and travelled through the cold weather; I left on April 21, accompanied by Mr. Foley, of the Indian Tea Association, and arrived at Nasratabad on May 27, thus spending the beginning of the hot weather in the desert plains of Baluchistan. The heat was very great in the middle of the day, but the nights during which we marched were, without exception, cool. Circumstances, too, were in our favour, for while we were passing through the Kachaki valley, between Mall and Padag, we rode through a heavy rain-storm, which considerably lowered the temperature, and there was also rain at Mushki Chah, cooling the air for our halt at Sahib Chah, reported to be the hottest place on the whole route.

From Quetta to Robat my route was identically the same as Lord Ronaldshay's, with the exception of two new stages between Dalbandin and Merui, and I can corroborate his remarks as to the advisability of Nushki being made the starting-place on this trade-route. Proposals are already on foot for the construction of a

BAUA PASS.

railway as far as Nushki, but whether this will be merely a continuance of the Quetta-Sibi railway, or whether it will be built between Nushki and Karachi, has not yet been determined. From Merui to Robat is the most arduous portion of the journey, and at two of the stages, Kundi and Sahib Chah, there is no sweet water. After Saindak the road skirts the edge of the mountains, which come to a point at the Kuh-i-malik Siah. From this damin, as it is termed, the Gaud-i-Zirra can be seen gleaming in the sun.

From Robat onwards the journey increases in interest. During the march to Hurmak, 17 miles distant, we passed the Ziarat-i-Kuh-i-malik Siah, or shrine of the black chief, and at Hurmak halted in a semicircle of hills faced by the long barren plain which lay between us and Sistan. Next day we crossed the Shela, a river whose banks were encrusted with a thick layer of salt, and reached Girdi Thana in two stages. Here the caravan route to Neh branches off to the west side of the Helmand lagoon, thus avoiding the dykes of Sistan, which present so much difficulty to camels.

From Girdi Thana can be seen the town of Ramrud, and soon afterwards we passed Huzdar. This town was deserted, but undamaged, except that the entrances of the houses had been partially choked by the constant sand-storms. The deserted cities of this country have already been referred to.

At Pusht-i-Dasht we reached the inhabited country, and after a ride of about 30 miles, the first 15 of which was occupied in crossing dykes, we arrived at the British Consulate at Nasratabad. During this march we saw several villages built exactly in the same style as the deserted ones we had just left. In fact, with the exception of the constant dykes and the various encampments of the Black Tented Beluchis, the country seemed hardly to have changed.

The consulate was founded in 1899 by Major Sykes, and the house was built by Colonel Trench during his stay of a year at Nasratabad on his way to take up the consul-generalship at Meshed. The town of Nasratabad itself has been fully described by Lord Ronaldshay, but my journey from the consulate to Bandan provides more incident. Being summer, the Helmand lagoon was full. My objective, Bandan, lay in the hills to the north, and it was necessary for my caravan to make a *détour* round the Kuh-i-Khoja, a small flat-topped hill standing alone in the plain to the south-west of the town, so as to avoid the lagoon. I had now changed camels for horses, which I bought in Sistan for an average price of £3 each. These, with my servants, I despatched on the morning of June 8, while I, taking a guide from the consulate, followed on the evening of June 9, intending to cross the lagoon. The first difficulty was a deep irrigation channel at Afzalabad, which I crossed just before dark. Here I learnt that the water was too bad to cross at night. In spite of my guide's anxiety to remain at Afzalabad, I rode to the edge of the lagoon, and slept there near a Beluchi encampment. About 4 a.m. we began to cross in tutins, reed boats shaped like Egyptian mummies, the feet at the bow and the head and shoulders at the stern. They are propelled by poles. We led our horses, who alternately waded and swam, showing there was no great depth of water. The passage took about four hours, during which time we were in a street of reeds about 6 feet wide, and in some places about 12 feet above the water, but in others much lower, though at no time could I obtain an extensive view of the lagoon while I sat on my tutin.

At Baring, on the other side, I found the servants and started for Bandan. During my journey through Persia I travelled entirely by day, starting usually an hour before sunrise, and halting in a caravanserai, orchard, or house between the hours of eleven and three. The road to Bandan lay across a plain leading to the mountains. Bandan itself lies at the apex of a triangle, two sides of which are mountains, with the plain of Sistan for the base. The road, therefore, was sheltered from the breeze which had been blowing over the lagoon, and the heat increased.

A SAND-STORM.

CROSSING THE HELMAND LAGOON.

The way lay over desert ground, with only one watering-place half-way. Bandan was reached after a nine-hours' march. The little town is walled, and there is a date-grove on the northern side, but this was the only shade I had seen, or indeed did see, till I reached the village of Shusp, a day and a half later. From Bandan there is a choice of routes. The one usually taken by caravans is longer, but affords two good halting-places, viz. Aliabad and Neh. The other, though more direct, leads through a waterless plain. This I decided to follow. I could get no definite information as to the distance, but by my progress I should judge it to be about 52 miles. I was actually marching for thirteen hours, and my average pace was 4 miles an hour. After 20 miles I found water in a cleft in the side of the mountains, but the only protection I got from the blazing sun was by crawling under an overhanging rock. Eight miles further on there was a stream, but this was brackish.

Next day I arrived at the village of Shusp. It was a welcome relief from the pitiless aspect of the last two days. I sat under a tree near the water while the inhabitants crowded round me. Some brought me apricots, and others drank the tea and smoked the cigarettes I provided for them. I was, however, by no means out of the barren country. During the next march I passed a large salt hamun before reaching Salabad, another consular post-station.

Mud, my next important halt, was the first place of any size I had seen since leaving Nasratabad. It is a long straggling town, and without is a walled fort Next day brought me to Birjand. At Bujd I obtained my first view of the town. To the left lay the Bakaran mountains, dotted at their base with innumerable villages. Eight miles in front of us lay Birjand, standing on three hills. Birjand is a depôt for Western Afghanistan, and goods are brought from Meshed, Bunder Abbas, and Quetta. It is from the two latter places that English merchandise finds its way into this country, and the cotton prints bear the names of well-known Bombay firms. I have since been told that the people of Birjand have a very great dislike for foreigners. Personally, all I met were extremely kind to me, and I never experienced any inconvenience with the exception of a few gamins, who would often follow me out of curiosity. Birjand, as a town, was intensely interesting. The labyrinth of streets, in which it was impossible for a stranger to find his way, its innumerable serais, the total absence of any European element, made me feel more vividly than any of the barren wastes of Beluchistan that I had left a telegraph and railway behind, and that there was still a corner of the world which modern civilization had left untouched.

When I left Birjand I continued my march for two days and a half in the Lut, skirting instead of crossing the mountains of the Kain plateau. From Mohamedabad I crossed the Khabisi pass, which separates the Kain plateau from the Lut, and during my ascent passed into fertile country. The first sign of culture was a large village luxuriant with orchards, and as we continued along the mountains the way led us by some large patches of turf, which in some parts were saturated with water forming a stream lower down. It was the first turf I had seen since I left Quetta. Among the vegetation on the road were some tea-roses. On the other side of the pass I halted in an orchard at the village of Dehisk, where we got mulberries, apricots, milk, and cheese, and then in the evening I continued my way to Dasht-i-Piaz. Our next march carried us across the Bana pass, overlooking the shrine of Kakh. At our feet lay the town on one side of a dry river-bed, while on the other stood the blue-tiled dome of the shrine gleaming in the sun, and stretching away in front was the plain of Gunabad, which lay between us and Turbat. The small caravan wound down the pass and then into the river-bed; the shrine which we had seen from the heights towered above us on the right, while the orchards of the town over the banks on the left. It was a fit place for a shrine, and as I passed all my Mohammedan servants bowed their heads in prayer. The country which lies between Gunabad and Turbat is really an arm of the great salt desert broken by vegetation at Amrani and Keirabad. Between Amrani and Keirabad there is a

INTERIOR OF MOSQUE.

MAIN STREET, MESHED.

sand desert, in which I was caught in a sand-storm. The desert extends for about 30 miles, and is reputed to be infested by robbers, but nobody tried to attack me, though Mr. Foley, who followed me some weeks later, was, I believe, hindered.

Turbat is situated not far from the foot of the Bidar pass. It is a long straggling town, the approach being through a street of orchards. I arrived there late at night, and found the caravanserai crowded with pilgrims on their way to the Holy City.

My route lay over the Bidar pass and thence through Asadabad Robat-i-Safid and Sharifabad to Meshed. The country was very mountainous, a range of hills separating Asadabad from Robat-i-Safid.

Just before reaching Sharifabad I saw the first telegraph-post I had seen since leaving Nushki, and in the afternoon continued my march through another belt of hilly country that lay between us and Meshed. Three hours before I reached my destination we could see the dome glittering in the sun. I arrived at the consulate at eight o'clock, where I was warmly welcomed by Colonel Trench, our consul-general. The Holy City itself I shall not attempt to describe. This has already been done by others, who have had more time to devote to the study of its bazaars, its crowds of pilgrims, the merits and abuses of the Mohammedan religion which form the life of one of the most remarkable cities I have ever visited.

Before the reading of the papers, the PRESIDENT said: We welcome this evening two travellers who have gone over a most interesting region between India and Persia, Lord Ronaldshay and Mr. Penton, who will each read a short paper. I will now call upon Lord Ronaldshay to read his paper.

After the reading of the papers, the following discussion took place:—

Mr. JOSEPH WALTON, M.P.: Having spent the recent parliamentary recess in travelling through Persia and Baluchistan, I have naturally been very much interested in the papers which have been read to us to-night, and I think we may congratulate ourselves that we still possess in this nation young men of education who have that spirit of enterprise which causes them to make journeys through far-distant regions for the purpose of gaining information and bringing it home to us in the interests of the British Empire. In the course of my journey through Persia I had not the time to traverse the Quetta-Nushki trade-route into Persia; my route lay from the Caspian sea by Tehran, Ispahan, and by the new trade-route from Ispahan, through the Bakhtiari country, and down the Karun river to the Persian gulf. After traversing that, and coasting down the Persian gulf, I entered India at Karachi, and went up to Quetta last November. There I had the opportunity of meeting Captain Webb Ware, who is in charge of the Nushki-Sistan trade-route, and of learning from him the marvellous progress that had been made in increasing the trade of India with Persia by that new trade-route. I quite endorse what has been said to-night as to the great desirability of having a railway constructed from Quetta to Nushki, and that Nushki should be the starting-point of caravans over that trade-route into Persia. Now, I understand that politics are debarred in meetings of the Royal Geographical Society, but when to-night we have two papers largely treating of the development of the commercial interests of the British Empire with Persia, and when one knows absolutely that the commercial and political interests of every country are so interwoven that you cannot separate them, one's task becomes somewhat difficult. At any rate, perhaps I may be permitted to say that, in the commercial interests of our fellow-citizens in British India, it is the duty of the British Government to give all necessary political support, so that the just commercial rights and interests of the British Empire and of British India, as regards trade with Persia, shall be upheld and maintained. The question of Persia, commercially considered, is an important one to the British Empire. I traversed Persia from the Caspian sea by Tehran and Ispahan, and then went by caravan across a succession of mountains, several hundreds of miles to the Karun river, and thence by the Karun river down to the Persian gulf. From Ispahan, *viâ* what is known as the Lynch caravan route, only took me thirteen days, whereas by the present trade-route, by Shiraz to Ispahan, occupies from thirty-five to forty days; there is therefore no doubt whatever as to the great importance of our endeavouring in every possible way to cultivate and develop British trade *viâ* the Karun river and the Lynch caravan route to the centre of Persia. The trade-route from Nushki *viâ* Sistan into eastern Persia is a land route, and it is by sea we have to develop the trade of this country and other parts of the British Empire with the Empire of Persia, and therefore it is that it is necessary that we should have every facility for increasing our trade in Southern Persia. Russia has built three roads into Northern Persia, one to Tabriz, another to Tehran, and another to Astrabad, for the purpose of facilitating her trade in Northern Persia. Therefore, all I would submit to-night is that we must take similar means in Southern Persia of facilitating the transport of Indian and British goods from the Persian gulf up into the interior of Persia. Another very desirable route would be from Bandar Abbas by Kerman and Yezd to Ispahan, and that, I think, from a British standpoint, is not less important than either of the other two routes that I have mentioned.

Major MOLESWORTH SYKES: Upon listening to the interesting papers which have just been read, the first thing that strikes me is the remarkable manner in which the one supplements the other. Generally speaking, the traveller is only able to give an account of the country he passes through at the particular time he happens to be there, whereas, by this happy combination of two travellers traversing the same country at different seasons of the year, we now obtain an accurate and graphic description of Northern Baluchistán and Eastern Persia. From Quetta to the British frontier I have not travelled across Baluchistán in this particular direction, but I can cordially endorse all that has been said about my friend Captain Webb Ware. I have recently received a letter from him in which he writes that the trade returns for the current year will be much greater than anything in the past. Both travellers remarked on the ruins of Sistán, and indeed, if asked the salient characteristics of that province, which is the delta of the Helmand, I should refer to its ruins. To the east of the capital they are even more extensive, as along both banks of what was, in ancient days, the main branch of the Helmand, there were towns and villages extending for at least 10 or 15 miles, and all of these show a very much higher state of civilization than the miserable mud hovels of to-day. We may thus feel certain that when Tamerlane swept across this country and wiped out the whole population, he put back the hands of the clock of civilization some hundreds of years. Lord Ronaldshay found the Helmand lagoon dry, whereas Mr. Penton crossed it on a *tutin*. Personally, I have a pleasant recollection of those *tutins*, as I enjoyed the very best shooting on them when being punted about the lagoon. In one reach I remember seeing the wildfowl so numerous that when they rose the noise of their wings was just like that of surf beating on a rocky coast after a storm. Both travellers referred to Birjand. I would add that from the Arabian sea up to Birjand the traveller will pass through nothing but miserable villages for about 600 miles. There is indeed no town between Birjand and the Arabian sea, and that shows what a desert tract we have to deal with. North of Birjand I saw the Bana pass described by Mr. Penton, and I remember some three years ago climbing a peak above that pass, and enjoying the view to the north and south. It is a view that can rarely be enjoyed except in Persia, as, owing to the extraordinary clearness of the amosphere, one can recognize peaks for 200 miles. Before sitting down, I should like to congratulate the distinguished travellers and express two hopes—the first is, that they may both be induced to return to the fascinating country which they have been describing to us; and the second, that other travellers, fired by their example, may follow in their footsteps.

The PRESIDENT: The two papers we have listened to with such pleasure this evening are certainly of very great interest. In this Society we have had a series of geographers and travellers for the last fifty years who have given us accounts of various parts of Persia. I do not go back so far as the days of Sir Harford Jones, or of Sir John Malcolm, but to our late President, Sir Henry Rawlinson, who always encouraged research, especially in Persia and the countries which border upon it to the eastward. But our knowledge has been developed very slowly, and we are much indebted to the two young travellers who have now given us so excellent an account of a very little known route, but one which is likely to become of very great importance as a trade-route between Persia and India. They have not only described the country in a most graphic way, so as to give us a very clear notion of the whole route from Quetta to Meshed, but, by means of the excellent photographs, they have imprinted these impressions on our minds. I think it was particularly interesting to look at the series of photographs of the mosque at Meshed, which appear to have been taken, if I understood rightly, by a Persian boy with a Kodak. I think the meeting will vote unanimous in thanking these two young travellers for their most interesting papers, and I now propose a vote of thanks to Lord Ronaldshay and Mr. Penton.

THE ARO COUNTRY IN SOUTHERN NIGERIA.

Captain W. J. Venour, d.s.o., sends us some notes on the country between the Niger and Cross rivers, recently traversed by the military expedition against the Aro tribe, the custodians of the dreaded "Long Juju," by which the people of a large part of Southern Nigeria have so long been held in awe. As is well known, the expedition, after severe fighting, was entirely successful, with the result that the power of the tribe has been broken, human sacrifice has been abolished, and slave-raiding effectually stopped in the region in question, while this is now being opened to legitimate trade by the making of good roads with bridges over the streams.

The country visited by the expedition consists in great part of hill and dale, thickly wooded. Near the coast and principal rivers the land is low and swampy, the clay subsoil being covered with a slimy deposit of decaying vegetable matter. Farther inland the country rises gradually, sandy knolls first appearing, and afterwards high ground, intersected by steep-sided valleys, generally traversed by streams of excellent water, but in their broader portions forming swamps in the rainy season. The lower lands are thickly wooded, but in the hilly districts between Unwana and Bendi (the latter of which is 1000 feet above the sea), the bush becomes much less thick, distant views being obtainable—an impossibility in the lowlands—while the sides of the valleys are planted here and there with yams and kassava. The surface soil is here sandy, with a subsoil of yellow or grey clay. The watershed of the country is a line of heights, running roughly from Akweti, on the Opobo, to Bendi, and formed by a spur of the range which runs north-west from the Kamerun mountain to near Lokoja; south of this line the country is drained into the Cross and Kwoibo rivers, north of it into the Niger. The Cross receives from the Aro country the Enyong creek, which runs nearly up to Bendi, and the Big Ikpa creek, also called the Eyera river. The Enyong, and its tributary the Isuitu creek or river, which joins it some 11 miles from its confluence with the Cross, are navigable for native canoes all the year round, and steps have been taken to make them also navigable for launches, so as to open regular water-communication with the Aro country. The beds of these rivers are sandy, the banks low, overhung with thick bush and flooded during the rains, when the water rises some 10 feet above the dry-season level. The current varies from 3 to 3½ miles per hour. The Cross river, which is tidal up to a few miles above Itu, is navigable during the rains for the smaller ocean steamers as far as the German boundary, but after the middle of November is impassable above the Ikorana flats, even by the river gunboat *Jackdaw*, which draws only 2 feet 9 inches. The Niger and its tributary the Orashi drain the western and north-western sides of the country, the Imo the south-western, and the Kwoibo the south-eastern, the last three having low overgrown banks. There are excellent fish in the Cross, Enyong, and Isuitu rivers, and the natives catch them in seine, throw, or drift-nets, in wickerwork pots something like elongated lobster-pots, or with hurdles of palm-leaves.

There are fourteen Aro towns, situated in a rough circle round the site of the Long Juju, and forming together, in the past, a sort of slave-trading republic. They also trade factory goods to the other inland tribes, among which they have settlements in many places. The term Aro is, in the country itself, applied only to those who are free-born on both sides for seven generations, the remainder being termed Inokuns. The true Aros are usually lighter-coloured and of a higher type than the Inokuns, and many of them have quite a Jewish cast of countenance. They alone may wear copper bracelets and silk clothes, and carry umbrellas. Matters affecting the whole community were placed in the hands of a general council, composed of an inner and outer circle, each of seven members, which met at Awraw—one of the smallest of the towns, but the seat of the hereditary chief of the tribe. The chief priest of the Juju was always a man of the Bianka family, from the town of Amovia. The slaves brought in by the Juju were apportioned on a pre-arranged plan among the fourteen towns, and when the numbers were above the average, a certain number were sacrificed as a thank-offering. Each of the towns had its own appointed trade-district, from which the rest were excluded. The Juju, which had never been seen by a white man until visited by four of the officers of the expedition, is situated in what is called the "Juju bush," in the centre of the fourteen towns, each having its own road to the Juju. The road used by the officers was barred by two successive screens, the second of which might only be passed by Aro men of importance. It is at the top of a narrow gorge, some 70 feet deep, and with very steep sides, traversed by a stream across which stretches a third screen. An opening in this gives access to the Long Juju itself—a circular pool of water, with a log hut from which the water issues. The bottom of the gorge was strewn with the decaying remains of the various offerings made to the Juju, which gave out a curious musty smell, adding to the weird impression caused by the gloom and silence of the place. Everything sacrificed to the Juju was white, and even in the case of human beings, albinos were preferred. In the pool were several sacred fish, and it was believed that the prosperity of the race depended on the perennial flow of the stream. In addition to the tribal Long Juju, each house has its own private juju.

The Aros are the dominant tribe of the Ebo family, which speaks one language and inhabits the whole central portion of the Southern Nigeria, extending on either side beyond the Niger and Cross rivers. The Unwanas, who inhabit the town and district of Unwana at the bend of the Cross river, from which one of the columns started, are an offshoot from the Aros and speak Ebo, but, though in a slight degree under the influence of the Long Juju, are very independent. They are a peaceable people, and have maintained friendly relations with the Government for ten years, never giving trouble. Both men and women are finely made and well developed. On reaching the age of puberty, children of both sexes undergo a course of instruction and are put through tests, one of which for boys consists in running twice round the town, a distance of some 4 miles, without stopping. The women of this tribe hold a much better position than is usual among West Africans, and it is said that they enforced their demands a few years ago by retiring *en masse* into the bush until they were granted.

REVIEWS.

EUROPE.

The Scenery of England.*

For some little time past our cousins on the other side of the Atlantic have been establishing a rather long lead in the advancement of knowledge concerning the laws governing the development of the present surface features of our globe; and the admirable essays on this subject, illustrated by the scenery of the American continent, and published in the official memoirs of the various States of the Union, are justly regarded as classics in either hemisphere. Recently, however, English geographers would appear to have devoted more attention to similar questions nearer home, and we have lately seen the appearance of three works on physical geography and geomorphology, which, taken together with the classical work of Sir Archibald Geikie on the scenery of Scotland, of which a new edition has recently appeared, will place students of British scenery in possession of the fullest information on this fascinating subject. Mr. Marr's admirable work on 'The Scientific Study of Scenery' deals with general principles, and his illustrations are drawn from every corner of the globe; while Mr. Mackinder's recent volume on 'Britain and the British Seas' is more purely geographical in its aim. The work before us is a fit sequel to the same author's 'Scenery of Switzerland,' and to English readers we feel sure will prove an even more attractive study.

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* 'The Scenery of England.' By the Right Hon. Lord Avebury. Macmillan & Co., Ltd. 1902. Pp. 521. Illustrated by two hundred photos and map and diagrams. Price 15*s.* net.

The first forty-four pages are occupied by a short popular account of the chief characters of the various geological formations met with in Britain, which will, no doubt, prove of service to the non-geological reader. Under the description of the Silurian we are reminded of the pride with which Murchison restored to currency the name of the old Welsh tribe, and it is therefore the more to be regretted that there is no mention of the essentially British term "Ordovician," now of world-wide acceptance, which has gone so far to accomplish the intention of its eminent author in settling a much-vexed question of nomenclature.

Chapter II. gives a general account of glacial action, and is one of the best illustrated chapters in the book. We regret, however, to see the misleading term "ground moraine" is still applied to the English boulder clay, which must undoubtedly have been carried interstratified with the ice, as in the case of all existing ice-sheets that have been examined. On p. 52 the author coins a new word for the English language, namely, "Manywhere," of which the editors of the new English dictionary should take note.

In Chapter III. we have a description of the configuration of the country, which should prove one of the most interesting in the book to the general reader; it is a very careful and thorough account of the chief causes which have determined the present general outline of the country and the origin of the chief mountain ranges and plains, together with evidences of former differences in level along our coasts as deduced from submerged valleys and forests, and from the presence of raised beaches. Under tectonic features the author points out the marked effect produced on the country by two dominating lines of weakness and earth movement. Thus not only the great glen of Scotland but the east coast of Sutherland and Caithness, and the outer coast of the Hebrides, Loch Awe, Loch Tay, and the Solway Firth, etc., follow the same trend; while in England we have the Menai Straits, the line of the Bristol Channel, and hill ranges like the Cheviots, Chiltern, etc. Another set of lines running north-west to south-east at right angles to the former, *i.e.* Loch Torridan, Loch Lomond, the Sound of Mull, etc., as also the Firth, Clyde, Tay, etc., seem to point to a general direction of weakness at right angles to the first. The author also considers that the intersection of the same two lines of weakness accounts for the peculiarities of some of our river systems not hitherto explained; thus the deflections of the Tees into the path of the smaller river Greta, and afterwards into that of the still smaller stream from Staindrop, may be directly due to these lines.

Chapter IV. deals with the configuration of our coast, the general principle of marine denudation and deposition being well set forth and aptly illustrated from various points along our coast-line as far as the limited space permits. *Apropos* of shore life Lord Avebury quotes the now discredited legend that Barnacles with their feathery legs were the ancestors of Barnacle geese, and the latter being therefore regarded as fish might be eaten in Lent.

In the following chapters the author treats of the origin of our mountain ranges, and notices the absence of any English term for the older buttresses against which the surrounding areas have been pressed by later movements, and recommends the adoption of Suess' term "Horsts." He also confirms his opinion, originally expressed in the 'Beauties of Nature,' that you cannot have folding produced by cooling and contraction in one direction without the initiation of a complimentary line of folding at right angles to this.

The chapters which follow on rivers call for no special comment; they are fully treated and well illustrated by photographs and diagrams, and include a useful map of the river systems of the south-east of England.*

In Chapter XII. we have a careful description of the different classes of lakes, and their probable modes of origin; with regard to the much disputed origin of lakes by direct ice erosion, the author openly favours the view that many of the lakes of Cumberland and Westmoreland are glacially excavated, for he remarks that the deepest part of these lakes occurs just where a glacier would produce most effect, and he justly calls attention to a fact, frequently lost sight of, that many lakes are in reality mere films of water, and their basins would remain unnoticed were it not for the presence of the water, this shallow character being specially noticeable in the Norfolk broads.

In Chapter XIII. we have a description of the influence of different rocks on our scenery, supported by a number of quotations from the works of famous geologists, the writings of such eminent authorities as Ruskin, Phillips, Woodward, Sedgwick, Symonds, Topley, Hull, Green, Murchison, and others being laid under contribution.

The concluding chapters of the book, which deal with scenery in its broadest sense, include such wide branches of the subject as the Nebular Hypothesis, the Hemihedral Tetrahedral Theory, and others.

The book throughout shows a very extensive acquaintance with the literature of the subject, and the most conscientious desire to do justice to all previous writers on British scenery, while at the same time the book contains numerous original suggestions. On controversial questions the author has stated the facts, and some inferences derived from them, with an impartiality rarely found in a work of this character, and his attitude in this respect can be well inferred from the following characteristic paragraph:—

"The causes which have led to the present configuration of the land are very varied, and even surfaces apparently similar may have entirely different origins. Our island has undergone change after change; elevation and depression, deposit and denudation, have succeeded one another over and over again. Some of these changes are clearly written in the geological history; there are some to which perhaps the clue is lost for ever, but the discoveries already made justify the hope that many problems which are still obscure will eventually be explained."

In any analysis of the origin of scenery there are two distinct and separate lines of inquiry which we may pursue. Just as in an analysis of human beauty we may, on the one hand, study with admiration the effect produced by the outer grace of form and the mutual relation of features and beauty of colouring, while, on the other hand, we may penetrate below the surface and marvel at the mechanism and skeletal structure on which the form depends, so in the case of scenery we may analyze the sensations of beauty produced by rolling landscape, by contrasts of elevation or by glorious tints on the one hand, or study the anatomy underlying the surface features, and the laws by which these have been evolved. In the present volume the author has treated the subject most fully from the latter point of view, but glimpses of the possibilities of approaching the subject from the former standpoint are given us from time to time, little restorations of portions of the anatomy of the landscape clothed minutely in their full beauty of form.

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* We rather demur, however, to the statement on p. 349 that the watershed of the Alps is gradually moving northwards as a result of the steep northern and gentler southern slope, northwards being evidently a misprint for southwards.

What exquisite pictures he gives us in the description of our English Downs in one of the concluding chapters!

"The Chalk Downs occupy the heart of England. Being as a rule higher than the surrounding country, the air is cool and pure, crisp and sweet; being generally in grass, they are silent and peaceful, giving a delightful sensation of solitude and repose, heightened rather than interfered with by the occasional tinkle of a sheep-bell or the cry of a plover.

"The Downs present a series of beautifully smooth, swelling curves, perhaps the most perfect specimens of graceful contour, and are covered with short, sweet, close turf. Turf is peculiarly English, and no turf is more delightful than that of our Downs—delightful to ride or to sit on, or to walk on. . . . The herbage of the Downs is close rather than short—hillocks of sweet thyme, tufts of golden potentilla, of milkwort—blue, pink, and white—of sweet grass and harebells; the curiously named 'squinancy-wort,' with its small but fragrant blossoms; here and there pink with heather, or golden with furze or broom; while over all is the fresh air and sunshine, sweet scents, and the hum of bees."

Truly we feel that were we not in the habit of considering the author as one of our most distinguished scientific men, we would look upon him as worthy to rank amongst our foremost poets.

The book is copiously illustrated throughout, and the author acknowledges his indebtedness to the photographic committee of the British Association for many of the photographs. Some of these occasionally leave something to be desired in the matter of reproduction, but this is, no doubt, unavoidable in a book of the low price at which this has been issued. We notice, however, that two photographs on pp. 210 and 211 by Prof. H. E. Armstrong are attributed to the late Prof. G. F. Armstrong. It is unfortunate that the plates have necessitated, as in other cases, the loading of the paper to an extent that makes the book for its size an intolerable weight.

E. J. G.

ASIA.

PERSIA.*

A journey, or series of journeys, extending to a length of 10,000 miles, within the limits of one of the most ancient, yet least appreciated, empires of the world, is certainly worthy of a full and detailed record; and when comprehending in its range of survey the satrapies of Cyrus and territorial conquests of Alexander, should possess for the serious reader a classical and even biblical interest. It is true that Lord Curzon, before setting out to assume charge of his splendid vice-royalty in India, left in the hands of his fellow-countrymen at home an admirable book, embodying the result of his own personal observation and study on the same theme; but Major Sykes tells us that, in his own case, he has touched but lightly on the provinces and cities exhaustively dealt with in that particular work, so that the hesitating reader need not presuppose that the newly published pages contain necessarily much that is old or superfluous. Our impression is, that upon the whole the above-expressed intention has been fairly carried out. We may add, moreover, that appraising the character of the two publications together, we shall pronounce the later one to be the outcome of intelligent and continuous exploration with a scientific aim, while the older one reveals rather the observation of the travelling politician in a department made specially his own. Briefly, the one book is mainly geographical; the other, in the uses which the author makes of his great natural resources, does not omit to include geography as an important element in his programme. At the same time we may explain that Major Sykes by no means excludes from his notice what may be called practical politics. The last chapter of his interesting volume is a notable case in point. It consists of some ten pages only, but the questions on which they touch are of great moment, and demand the close attention of diplomatists at home and abroad. Though discussion on the separate subjects treated would be here out of place, it may be well *en passant* to express individual concurrence in the Kerman consul's opinion that a "proposed scheme for running a railway along the coast of Southern Persia would end in failure," if that opinion refers to the land between Fáo and Jashk. On the other hand, a land-line, which may be roughly indicated by the combinations "Baghdad-Shiraz" and "Shiraz-Bandar Abbas," might be commercially advantageous; nor, except in one or two localities, would it present extraordinary engineering difficulties. So far as generally known, however, neither one nor the other of these lines could be constructed at the present hour by any Government, save that one which has long since made special provision for its own participation in respect of Persian railway development.

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* 'Ten Thousand Miles in Persia; or, Eight Years in Iran.' By Major Percy Molesworth Sykes. John Murray. 1902.

A glance at the table of contents of the volume before us will show what are the localities of which our enterprising traveller treats, and give some idea of the large area traversed in his several expeditions. He tells us that he left London in January, 1893, to undertake a journey which proved to be the first of many more of a like description. All his routes lay primarily in the direction of Persia, which country offered him, as it had offered to many others before him, many special attractions. The desire to explore little frequented tracts, to identify sites of ancient or mediæval history, and otherwise to utilize the opportunities of travel, evidently grew upon him as he proceeded on his way, and fortunately the authorities in the Foreign Office were not insensible to services which could not but impart new prestige to the resources of Downing Street and add life to its Oriental archives.

For a time he had the advantage of intellectual and sympathetic companionship in the person of Miss Ella Sykes, his sister, who, in addition to other exceptional qualifications, was possessed of a ready and fluent pen. In that lady's agreeable narrative describing her own experiences of Iran, she relates how her brother returned from his second journey to the Shah's dominions in June, 1894, and that in November of the same year she accompanied him on his third journey, at a time when he was commissioned to found a Consulate in Kerman. At this city also it fell to her lot to prepare for him a civilized English home, a luxury heretofore little known to our fellow-countrymen visiting Eastern Persia. Domestic quiet, however, was subsequently exchanged for further wanderings extending from Quetta on the one side to Muhamreh and the Karun river on the other. In the month of February, 1897, after looking in at Constantinople and revisiting Tehran, the travellers reached England again *viâ* Vienna, Munich, and Paris, "after an absence of roughly two and a half years." Not many months later, Major Sykes writes, "to use the Persian expression, the drum of departure was beaten, and I quitted England for my fourth journey in Persia." About the autumn of 1898 he was instructed to found a Consulate in Sistan.

His later chapters may seem to partake, more or less, of a stray and detached character, but they are by no means deficient in interest and instruction. If the Karwan expedition (chapter xxiv.)—an incident of likely occurrence until the surroundings of British India, as well as British India proper, are in a state of perfect quiescence—be treated as a footnote or an allusion, the identification of places visited by Marco Polo, the death of Baffin—perhaps the brightly illustrated account of the game of Polo, and other quasi-episodes, are far from unwarrantable digressions, and quite as appropriate to the general character of the book as the interpretation of the mysterious *Lút* and *Kávir*—expressions which belong essentially to Persian geography.

With few and unimportant exceptions, the illustrations are admirable and well chosen. Among the last in the handsome volume, we would instance the standing figure in the "Helmand Lagoon" (p. 388) as very effective; also the clearly executed "Hall of Xerxes" (p. 326). The "Bana Pass" (p. 408) and "Parsi Family" (p. 422) merit particular notice. "Birjand" (p. 398) will pleasantly recall to members of the first Sistan mission one of their chief halting-places in 1872.

Independently of geographical considerations in the strict sense of the word, it is satisfactory to notice how observant is Major Sykes of the character of Persian governors and others of all classes with whom he is brought into personal contact. His description of the Farmán Farmá, Abdul Huséin Mirza, is not only creditable to the writer from his desire to pourtray the superior native in his true colours, and do him that justice which is not invariably accorded by travellers, but in evincing his own discrimination and appreciativeness. We may take it for granted that friendly and companionable Persians are to be found here and there throughout the Shah's dominions, for those Europeans who are able and willing to understand them, but it is by no means to be inferred that the better educated are always the worthier of our attention. A very different man from the polished and educated Farmán Farmá, or Governor-General just mentioned, was Muhammad Ismael Khan, the Vakil-ul-Mulk of Kerman, to whom Major Sykes refers in a previous page as one who "did so much for the province over which he exercised actual control as to earn the right of being considered one of its great rulers—almost every *caravanserai* now in repair, the bazaars of Kerman, and many villages being constructed by him." To this high functionary it was once the pleasing duty of an English traveller in the sixties publicly to express his warm acknowledgments for a kindly and courteous reception, and acts of unmistakable friendliness. But the style of Persian illustrated in this case was that of the blunt, plain-speaking disciple of an old school, which never had had the advantage of European training or travel.

When a small mission was deputed, forty years ago, to explore the Mekran coast west of Karachi and to arrange with the local chiefs for the protection of a contemplated line of telegraph, it was accompanied by an escort of Sind Horse up to the fishing-village of Gwádar. Beyond that place it was not thought expedient to proceed with like formality until the period had become riper for entering into negotiations with Persia on the actual limits of her claim to territory west of British India. This claim, vague and uncertain at the best, had been asserted by a succession of encroachments injuriously affecting the poorer classes of cultivators, and more especially detrimental to traders and inhabitants of the adjacent Indian tracts who had dealings with the neighbouring Baluchis or Mekranis. Reference to the local archives of the day would at once show how keenly alive were the politicals of Upper Sind to the urgency of this determination of a permanent frontier. It was not, however, until seven years after the return of the above-mentioned mission from Gwádar that the officer in charge of it was able to continue his explorations up to Chahbar, a point still further to the westward. Then the whole question of the Perso-Mekran boundary had been more or less mooted in Tehran, and somewhat later still the *venue* of discussion was transferred to Sistan and Western Afghanistan.

To the present writer, who had the privilege of breaking ground in the Mekran question of 1862, and for ten or eleven years later had more or less to do with that and other questions affecting our political relations with Persia and her neighbours in the East, it is a cause of congratulation that during the period of the last thirty odd years so much good work has been accomplished in the geographical area referred to. On this subject, he ventures to repeat, in conclusion, a passage from a brief introduction which he recently contributed to a new edition of the "side-saddle" journey, to which allusion has been already made :

"Whilst visiting Kerman in January, 1866, little did I dream that an English lady would, about a quarter of a century later, not only find a pleasant residence in that city, but pass peacefully through the less civilized Bampur, on an English side-saddle, to join the camp of a boundary commission as far east as Quetta. No need have we now to turn back for information to old records of travel such as supplied by Pottinger, Grant, and Christie. All these have been supplemented by up-to-date labours. Our relations with Afghanistan are reasonably amicable; those with the neighbouring Kelat state have undergone more than one process of happy modification; and it is satisfactory to certify that these changes of condition mean upon the whole real progress, and that—thanks to his Majesty's Indian Government and the Royal Geographical Society—the outcome of that progress, whether theoretical or practical, is being turned to account by political and scientific experts who are themselves competent chroniclers."

Among these a prominent place may be assigned to the author of "Ten Thousand miles in Persia."

F. J. G.

GENERAL.

C. MÜLLER'S PTOLEMY.*

Students of the geography of the ancients are under a heavy debt of gratitude to the late Charles Müller, for, apart from minor contributions to their department of science, they already owe to him an addition of Strabo, with an incomparable *index variæ lectionis*, which must be looked upon as final, as to its text and the various questions of philology and palæography connected with it; as also a most satisfactory edition of the 'Minor Greek Geographers.' † At the time of his death Müller was still engaged upon an edition of Ptolemy, the first part of which was published nearly twenty years ago. This work he was not permitted to complete. The second part recently issued only carries us to the end of the fifth book, and the last five chapters of this book are due to his successor, Dr. Curtius Theodore Fischer, of Dresden. It is some satisfaction to learn that the enterprising firm of Firmin-Didot does not intend this edition of Ptolemy to remain a *torso*, as has been the fate of Wilberg's edition. It is proposed to publish a second volume, which will not only contain the remaining book, but also exhaustive prolegomena, or rather epilegomena, and a very full index. But unless more rapid progress is made than hitherto, few among the older generation will live to see the completion of this work.

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* 'Claudii Ptolemæi Geographia instruxit Carolus Müllerus.' Vol. i. (with atlas). Paris: A. Firmin-Didot. 1883–1901.

† 'Geographi græci minores.' Paris: A. Firmin-Didot. 1855–61.

Mr. Müller gives the Greek text of the original, together with a Latin translation. In preparing his text the editor has consulted as many as thirty-eight Greek codices as compared with thirteen consulted by Wilberg. Eleven of these codices are to be found in the Bibliothèque nationale, nine at the Vatican, four in the Laurenziana, and three at Oxford. The various readings are given in footnotes, and users of the work are thus enabled to reject the conclusions of the editor in favour of their own ideas and fancies. At the first glance, the new readings introduced by Mr. Müller do not strike us by their magnitude. We have taken the trouble to compare Wilberg's readings of chapters vi. to viii. in the fourth book with those accepted for this new edition, and find that the spelling of fourteen proper names has been slightly altered, and that two latitudes and six longitudes have been shifted, the most important change affecting Coloe, which has been moved seven degrees to the east.

Of the utmost value and interest are the annotations dealing with the sites and modern representatives of the places and peoples mentioned, not only by Ptolemy, but also by the other geographers of antiquity, and even by the Arabs. It is obvious that the results of the more recent researches into ancient topography could not have been embodied in a work which has been in hand for over twenty years, nor will the conclusions arrived at by Mr. Müller be acceptable, in every instance, to students of ancient geography.

Interior Libya and Ethiopia are the two regions regarding which commentators still differ most widely in their interpretation of Ptolemy's statements. As regards the former, Mr. Müller, very wisely, as we conceive, has followed the lead of Walckenaer and Vivien de St. Martin, and discarded, without ignoring them, the extravagant views advanced by Leake, Berlioux, and Roscher. It is, of course, quite possible that the ancients had some knowledge of our Niger, but Ptolemy, most certainly, had no such knowledge. His *Nigir* has most satisfactorily been identified with various Wadis in the northern Saharas, where also are to be found other localities included in his tables.

In Ethiopia, on the other hand, Ptolemy has been credited with an amount of knowledge which we feel sure he never possessed, and his hypothetical Nile lakes are laid down upon the map as if he had learnt their existence from trustworthy itineraries. As a matter of fact, Ptolemy knew very little about Abyssinia and the source of the Nile. He had never read Strabo, he had not gone for information to the very trustworthy Periplus of the Erythrean, and had never heard about Nero's abortive expedition in search of the source of the Nile. Of the few places mentioned by Ptolemy as existing in this extensive region of Africa, only three can be said to have as yet been satisfactorily identified, viz. Axum, Garbartus Mons, and the Cinnamon Land. About Axum there can be no doubt, Gabarta may safely be identified with the Jabarta of the Arabs—that is, the hill country of Shoa, as suggested by Cooley; whilst Cinnamon Land, which Ptolemy places in contiguity with his Nile lakes, actually lies on the Somal coast, or 15 degrees away from them. Ptolemy's Coloe is supposed by Müller to be a different place from the Coloe of the Periplus, the ruins and vast reservoirs of which were discovered by Count Russell in 1860, on the road from Adulis to Axum, and which has recently been visited by Mr. Bent, and fully described and surveyed by Dr. M. Schoeller and Dr. Schweinfurth. Ptolemy's Coloe is supposed to be identical with the modern Kola, an insignificant village about 50 miles to the north of Lake Tsana, visited by

Rüppell. But how can we suppose a lake lying in the Waina-dega to have been named after a village lying 50 miles away from it, in the lowland of "Kolla"? Moreover, on Ptolemy's own map this lake is placed to the south of Gabarta, that is, within the lake region to the south of Shoa, a region abounding in myrrh, and thus identical with Ptolemy's Myrrhifera. The river immediately to the west of Axum, which Ptolemy calls Astapus, is undoubtedly the Takazze, or Upper Atbara, which the early Portuguese visitors to Abyssinia deemed to be an effluent of Lake Tsana. Crossing this river into Semen, we enter actual "Pylæi." Yet Müller would have us look for these Pylæi Montes on the upper Nile, above Lado. Fra Mauro already identified these snow-clad mountains of Abyssinia with the "Ciebelchamir" of the Arabs, or the Mountains of the Moon, which, according to Dr. Müller, are represented by Mounts Kenya and Kilimanjaro, the existence of which has only recently been discovered. The Nile lakes of Marinus were probably the lakes described by Artemidorus as lying within Somal Land, and assumed by him to be sources of the Nile, when actually they were connected with the Webi, or Nile of Makhdeshu. Ptolemy very naturally rejected the notion of a river like the Egyptian Nile taking its rise in lakes lying so near the east coast of Africa, and therefore shifted them inland. The only Nile lake known to the ancients was the Tzana; the snows which fed the Nile were derived from the mountains of Abyssinia; the white Nile was known no higher up than the swamps, which baulked Nero's explorers; while the Nile lakes of Ptolemy are mere hypothetical lakes, which ought not to be identified with the Victoria Nyanza and Lake Albert. Nor were the Arabs any better informed on this point than Ptolemy, for their Kura lake is clearly Lake Chad.

Not the least valuable part of Dr. Müller's work consists in its atlas, which contains Ptolemy's own maps, face to face with modern outline maps, upon which the Greek geographer's information has been inserted. Taken all in all, this work of Dr. Müller is a monument of wonderful industry. No student of ancient geography can dispense with it, and it will give him ready access to information scattered in hundreds of volumes and treatises. E. G. R.

THE MONTHLY RECORD.

EUROPE.

The River Systems of Southern England and Wales.—An interesting paper on the origin of the river system of South Wales, and the light shed by it on the main systems of Southern England, was read in February last before the Geological Society by Mr. A. Strahan, and is printed in the *Quarterly Journal* of the Society for May 15 (No. 230). It is pointed out that the Severn and the Wye, which flow east from the main Welsh water-parting, are succeeded to the south by a series of streams rising on subsidiary divides in the counties of Brecknock, Monmouth, and Glamorgan, and these again by a group flowing south from the western extremity of the main divide. It is to these rivers of South Wales that especial attention is directed, the writer first discussing the relations of their valleys to the geological structure. The first group of streams, which includes the Usk, Rhymney, Taff, etc., all show a parallelism in a south-south-easterly direction, and their courses are maintained regardless of the structure. In spite of the number of faults of the north-north-westerly system by which the district is traversed, the coincidence of valley with fault is rare. In the next group, which includes the Neath, Tawe, Loughor, and Towy, the direction is about west 30° to 40°

south, or at right angles to that of the first group, and the change takes place in a region where a powerful set of disturbances first manifests itself, the direction assumed coinciding so closely with that of the disturbances as to prove that it was determined by them. Beyond the influence of these disturbances, the Taf and the Cleddau again assume a more normal direction at right angles to the main water-parting, this being the case with all the rivers outside the area of special disturbance. We can thus locate the axis of the elevatory movement by which the drainage was initiated, and we find that it was parallel to the direction of the subsidiary disturbances by which certain of the river-courses are controlled. An examination of the three great systems of movements, differing both in character and direction, which have affected the region, shows that the rivers were initiated by the latest of the three—the Caledonian of Lapworth. They entirely ignore the structures produced by the two earlier movements, and it is considered reasonable to assume that the river system was developed upon a slope of Upper Cretaceous rocks, by which all features in the Palæozoic strata were blanketed over. Comparing the main water-parting of Southern England (which coincides in the main with the chalk escarpment, and must have been originally formed by an anticline from which the escarpment has receded in varying degrees) with that of South Wales, Mr. Strahan finds that from both the rivers take a normal eastward course, the instances of deflection being comparable in the two cases. The axis of upheaval in the chalk is parallel to the Caledonian disturbances above alluded to, and it is thus concluded that the initiation of the South Wales and South of England river systems was due to one and the same movement, which was also accountable for the westerly deflection of the Severn. Its date is placed between the Oligocene and Pliocene periods.

A Seiche on Loch Trieg.—During the survey, in connection with Sir John Murray's scheme, of Loch Trieg, Invernesshire, Dr. T. N. Johnston and Mr. J. Parsons observed a variation of level, apparently of the nature of a "seiche"—a phenomenon hitherto not observed on a Scottish lake. The amplitude of the seiche, if such it be, is extremely small—only $\frac{9}{16}$ inch; but, during the 40 minutes in which the rise and fall was carefully observed, the oscillations took place with great regularity, the period averaging 9·5 minutes. The surface was perfectly calm at the time, and it was thought impossible that the variations could be due to surface ripples.

Freezing and Thawing of the Norwegian Lakes.—A careful investigation of the phenomena of freezing and thawing of the Norwegian lakes, with especial regard to the dates at which they occur, has been carried out by Andreas Holmsen, who has published the results in a memoir brought out under the auspices of the Fridtjof-Nansen Fund. The author has brought together a very complete body of statistics, which he has illustrated by a series of curves showing the meteorological and other conditions prevalent in the case of each of the lakes during the time of freezing. In a French *résumé* given at the end, he sums up the results of his study of the statistics as regards the various factors to which the observed phenomena are due. The general rule that the comparative dates of freezing depend on the altitude and latitude of the lakes is subject to many exceptions, some lakes at high altitude, and others in northern latitudes, remaining open to a comparatively late date. Of the meteorological factors which account for the precise moment at which freezing takes place, the most important is, of course, the air-temperature, while the state of the sky, the occurrence of atmospheric precipitation, and the force of the wind play but a subordinate part. Of the local factors, the chief is, naturally, the depth of the water. Mr. Holmsen finds that in the shallow lakes (with depths up to 30 metres, or 100 feet) the interval between the date at which the air-temperature falls to the freezing-point, and that at which the lake is covered with ice, varies from one and a half to three weeks, while for lakes over 100 metres in depth an interval of ten to twelve weeks is, in general, necessary, which often prevents their freezing at all. The influence of other local factors (affluents, currents, shape, etc.) is quite secondary, except in the case of small lakes. A special section is devoted to "polar lakes," in which, as the summer temperature does not rise above that of the maximum density of water, an "inverse stratification" of the layers of water is observable. Here the conditions of freezing are, naturally, exceptional. As regards the actual process of freezing, the formation of ice sometimes takes place with enormous rapidity, instances being cited in which it is possible to cross the lakes on ice formed in a single night. The thickness of the ice is fairly constant in the different lakes even under varying conditions, the average being from 1·3 to 1·6 feet. The melting of the ice depends still more than the freezing on the variations of air-temperature, and it is thus possible to draw a map with curves joining those places where the break-up occurs on the same date, such curves being in general agreement with those showing the isotherms of 32° Fahr. at the same date. Other factors, such as the thickness and structure of the ice or the existence of currents, exercise, however, some influence.

The Crypto-depressions of Europe.—The term "crypto-depressions" has been applied to those parts of the land-masses of the world which are depressed below sea-level, but in which this fact is masked by the filling of the hollow with water. In other words, they are lakes whose bottom falls below sea-level. A short account of the European depressions of this kind is given in the April number of *La Géographie*, by Dr. Cvijić, who shows that they occur in two different regions—the one on the borders of the Adriatic, the other in Northern Europe. The character of the depressions is different in the two regions, in accordance with their different origin. Of the Adriatic group, the lake of Scutari, sounded some years ago by Dr. Kurt Hassert and lately with more completeness by Dr. Cvijić, is cited as an instance. Its formation, like that of all the lakes of this group, is due to tectonic causes—fracture and subsidence. It is, in fact, a "karstpolje," and the funnel-like holes which have been revealed by soundings along its south-west shore are submerged "dolines." Various other lakes of Dalmatia and Albania belong to this category, and the lakes of North Italy, the chief of which sink in their deepest parts below the level of the sea, are also due, Dr. Cvijić says, to tectonic causes. The second class of crypto-depressions are the fiord-like lakes of Great Britain, Scandinavia, Finland, and North Germany. They appear to be limited to the area of former glaciation, and present striking analogies with the Scandinavian fiords, having been, in Dr. Cvijić's opinion, in great measure deepened by glacial erosion. Those who deny the power of ice to excavate to this extent would no doubt explain them as blocked at their lower ends by glacial deposits, the original valleys having possibly had a normal profile. The existence of a depression below sea-level can hardly be considered a scientific criterion of a natural class of lakes, as the fulfilment or otherwise of this condition must depend in many cases on general movements of elevation or depression quite unconnected with their original formation. Still it is of interest to note that, where such lakes occur, one or other of two classes of phenomena seem, as a general rule, to be involved.

The Hungarian Lowland.—The *Abrégé* of the Bulletin of the Hungarian Geographical Society contains the abstract of a paper by Dr. Géza Czirbusz on the origin of the Hungarian Lowland, in which certain views are put forward which differ from those of some other students. The writer points out that while it has long been recognized that the Hungarian plain forms one of the series of basins belonging to the system of the Danube, which have been filled in in succession from above downwards, it is not so generally understood that in their broad outlines the contours of that plain had already been determined at a very remote epoch, and that both the deposits of the old sea and lakes, and the courses of the rivers, have been subordinated to the original fundamental lines. Thus it is held that, among other instances of a similar character, the Nyir plateau is not formed by the deposits of the rivers Szamos, Kraszna, and Tisza, but that it is of older date, and that the course of the Tisza has been determined by its previous existence. The idea that either the Tisza or the Danube has, in process of time, shifted its course westward over the plain in accordance with Baer's law is also negatived by Dr. Czirbusz, who maintains that both still flow in the main as they have done for long ages, the Tisza in the course determined by the original deposition on the plain, the Danube in its primeval bed on the margin of the trans-Danubian line of dislocation. He considers that the Hungarian Lowland may be divided, on geological and hydrographical grounds, into two portions, a lesser and a greater, the latter coinciding with the Alföld. Each may again be subdivided into separate smaller units.

The Atmosphere in the Neighbourhood of Vesuvius.—At the present time, when so much attention has been directed to volcanic phenomena through the catastrophe in the West Indies, a paper recently published in the *Proceedings of the Finland Society of Sciences*, on the influence of Vesuvius on the air of the neighbourhood, is of some interest. The author, Mr. G. Melander, undertook his researches with the object of testing the part played by the dust-particles ejected by the volcano in the condensation of atmospheric vapour, and his observations on the amount of dust contained in the air of different localities were made with the Aitken dust-counter. In order to study the smoke as near to its source as possible, Mr. Melander first carried out observations on the summit of Vesuvius, but was surprised to find apparently scarcely any suspended material, even in the midst of the smoke. This is explained by the large proportion (50 per cent.) of water-vapour contained in the smoke discharged, such vapour being condensed round the particles and even dissolving those formed of salts. It was, therefore, necessary to make observations, when possible, at a distance from the volcano, at points where the band of smoke descended towards the Earth's surface. This Mr. Melander succeeded in doing on several occasions, his results showing a maximum of 63,500 particles per cubic centimetre, the dust having, in this case, become dry during its passage from the volcano to the place of observation. On another occasion, when the relative humidity of the air was high, a fine rain was found to be falling immediately beneath the centre of the column of smoke, though none was observed on either side. The maximum number of particles observed on this day was 7775. The general conclusion arrived at is that the smoke of volcanoes does contain particles calculated to bring about a condensation of the atmospheric vapour, and that they are probably salts of chlorine and sulphur.

Improvement of French Ports.—The official *Journal de la Marine* gives particulars of recent work on the French ports, upon which considerable sums of money have lately been expended. At Dunkirk, where dockyards are being constructed and the outer port enlarged, £100,000 was spent last year. The projected works, however, which are to conclude the displacement of the fortifications and the acquisition of land for the further enlargement of the port, will entail an expenditure of over £1,000,000. At Dieppe the dredging of the tidal harbour is being proceeded with, and the works in connection with the improvement of the entrance to the port which are to be undertaken are estimated to cost nearly £200,000. The proposed improvements at Havre will cost £800,000, and a similar sum is required to open the port of Nantes to vessels with a draught of 17 feet. The construction of another floating dock and a graving dock at Bordeaux will cost half a million sterling. Proposals are also made for improvement works at Boulogne, Bayonne, and Cette.

ASIA.

Observations of the Dead Sea Levels.—There appears to be substantial evidence of a general rise in the level of the waters of the Dead Sea, causing the submergence of certain of its natural and artificial features, even within the memory of people now living on its shores.* Mr. Macalister and Mr. Masterman have been making a series of observations on the seasonal and annual variations in the level of this sea, with the view of determining whether the level is still rising, or the reverse, and at what rate change is taking place. So far there has hardly been time to allow of generalization, but some interesting facts have already been brought to light, and are recorded in a recent number of the *Quarterly Statement* of the Palestine Exploration Fund. The extent of seasonal variation in level appears to be far less than some writers on this subject have supposed. Mr. Masterman writes: "I think we are within the limit in saying that the difference in level between the lowest in 1900 and the highest in 1901 was under 1 foot 6 inches, and that the difference between the latter and the lowest in 1901 was within 2 feet 6 inches." He attributes the low level in 1901 to an exceptionally dry season, and hopes that a normal rainfall will enable a fair judgment to be formed in the course of 1902. In making these observations Mr. Masterman used an ordinary tape measure, one end of which was weighted and dropped to the level of the water, while the other was laid against a mark cut on the face of a rock on the shore between 'Ain el-Feshkhah and Râs el-Feshkhah. The steamer about to be launched on the Dead Sea should greatly facilitate the scientific study of the lake in the near future.

Austrian Explorations in Northern Arabia.—Dr. Alois Musil, a young theological *savant* from Olmütz, who has also studied at the École Biblique carried on by the French Dominicans at Jerusalem, has, since 1897, carried out five separate journeys in the desert of Northern Arabia, south and east of the Dead Sea, in part at his own expense, and in part with the support of the Academy of Sciences and private individuals in Vienna. The main object of his last three journeys was the examination of the "Kosseir," or castle, of Amra, lying far away in the desert, and long avoided by the Bedawin from superstitious dread. Though mainly of interest from the point of view of art and history, his researches are also valuable as throwing light on the geography of culture, inasmuch as it has been shown by his latest journey (April to July, 1901), that Kosseir Amra belongs to the series of castles built by the Khalifs at vast expense, as veritable palaces of luxury, from the beginning of the ninth century onwards, on the eastern and western margins of the north Arabian desert, then the favourite resort of the grandees of the time. One of the Khalifs built no fewer than twenty-five of these castles of ease, which bore names such as "The Blush of Dawn," "the Pearl," and so forth. It was his nephew, Prince Ahmed, great-grandson of the great Harun al Rashid, and afterwards Khalif from 862 to 866, who built this castle of Amra about the middle of the ninth century. Its chief claim to notice consists in the splendid pictures and mosaics with which the interior was adorned, and which supply a positive proof that in the early days of Islam painting was not a forbidden art. The fifth and last of Dr. Musil's journeys was carried out amid great difficulties and dangers, but it has yielded important results in the field of linguistics and ethnology, as well as with regard to the little-known topography of the region.

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* A year or two ago we referred (*Journal*, vol. xvi. p. 555) to Mr. Gray Hill's observations on the rise of level, published in the *Quarterly Statement*, Palestine Exploration Fund, 1900. In a subsequent number Sir Charles Wilson gave reasons for not accepting Mr. Hill's explanation of the cause.

The Trade-routes of Persia.—The difficulties of communication in Persia still form the chief obstacle to trade in that country. In the north there are two principal routes by which goods are conveyed to the capital. The first, which is described in the latest Consular Report as open almost solely to Russian trade, is by sea to Batum, and thence across the Caucasus to Baku, at which port the goods are shipped to Resht. The journey from this town to Teheran takes from 14 to 18 days, and was, until lately, only possible for pack-animals; but the new Russian road connecting the coast with the plateau has rendered wheeled transport available, and springless waggons are in some cases employed. Antwerp firms undertake the transport of merchandise to Resht at from £12 to £14 per ton; but from here to Teheran the charge, by mule or camel, is £16. The alternative route from the north is *viâ* Trebizond, Erzerum, and Tabriz; but this route is becoming disused, owing to the high price of forage and the proportionately large transport charges, which are as much as £40 to £50 per ton. The southern routes are therefore preferred by importers, and these are also two in number. The first is *viâ* Bushire, Shiraz, and Isfahan, a distance of 779 miles, which the caravans accomplish in from three to six months, the road as far as Shiraz being very difficult. The cost of transport from the coast by this route is about £20. The other trade-route, which is much frequented, is from Basra to Baghdad, and thence *viâ* Kermanshah to the capital. This is very much shorter, being only 503 miles; but the Customs formalities in Turkish territory, and a transit duty of 1 per cent. *ad valorem*, are a counterbalancing disadvantage, and the cost is about the same as by the last route. The time taken, however, is shorter, being ordinarily about three months; but in this, as in the case of the other routes, neither prices nor times can be regarded as fixed.

Emigration from India.—An instructive report upon the emigration of coolies from British India has lately been issued by the India Office. During the last twenty years of the century 304,000 left the country, and 133,000 returned, the number remaining expatriated being 171,000. The shifting Tamil labour-supply to the Ceylon coffee plantations is not comprised in the above figures, nor the passengers unrecruited by emigration agencies, nor the Mecca pilgrims. The report is confined to indenture emigrants proceeding for the most part to our colonies and protectorates. In many of these places the settled Indians are increasing in number. In Mauritius about 69 per cent. of the population —261,739 out of 379,659—are either Indian settlers or their descendants, and in British Guiana they number about one-third of the population. Emigration is by law confined to Calcutta, Madras, and Bombay, but from the latter it ceased some years ago, labour in the Western Presidency being so well paid that there is no particular inducement to leave the country. An exception has, however, lately occurred, numbers of men having during the last three years been sent from here and from Karachi for work on the Uganda railway. The main stream of emigration flows down the Hugli from the thickly populated districts of Oudh and Bihar and the eastern part of the North-West Provinces. Nearly 12,000 were thus shipped from Calcutta last year, and went to British Guiana, Trinidad, Natal, Mauritius, and Fiji. From Madras about 7000 were shipped, their destination being Natal and Mauritius. The numbers leaving India appear to be yearly increasing. Last year 26,508 emigrated, the largest number (8032) going to Mombasa, and the smallest (2450) to Trinidad.

The Development of the Philippine Islands.—For many years previous to the war between Spain and America the establishment of a network of railways throughout the most populous districts of the Philippines had been under consideration, but the Manila-Dagupan railway, which runs northward from the capital through the great sugar districts, is the only portion which was ever constructed. This has been opened for nearly ten years. A scheme for the railway development of the islands on a large scale has recently been sketched out by the Acting Civil Governor, who in his report advises that about 1000 miles of railway, to cost about £7,000,000, are required in the island of Luzon alone. This will include a trunk line of about 600 miles in length, an east-and-west line across the island from the capital, a northward extension from Dagupan of the already existing railway, and two or three short feeder lines. It is also intended to develop Mindanao, which, though the least-known island in the archipelago, is believed to be the richest; coal and gold both existing—the latter, it is thought, tolerably abundantly—in addition to fine forests of ebony and teak. The report recommends that the Philippine Government should have authority to grant special charters for railways, and that the home Government should guarantee interest.

AFRICA.

Dr. Kandt's Map of Lake Kivu.—The German explorer, Dr. Kandt, who has devoted so much time to the scientific investigation of the Lake Kivu region, was some time ago reported to be returning home with the members of the German Commission for the delimitation of the Congo-German frontier in the same region, which has now finished its labours. Meanwhile Dr. Kandt's long-expected map of Lake Kivu has been published in the new colonial publication entitled *Beiträge zur Kolonialpolitik und Kolonialwirtschaft* (1901-1902, No. 12), accompanied by a monograph by A. von Bockelmann, in which our knowledge of the Lake Kivu region, as derived from the accounts of the various travellers who have visited it within recent years, is summarized. While naturally differing much from the rough sketch published in 1899 on the basis of Dr. Kandt's letters (*Journal*, vol. xv. p. 178), the finished map agrees in showing the axis of the lake as more inclined from a due north-and-south line than is shown by Grogan, Fergusson, and others. How far this is based on astronomical observations or on accurate determinations of compass variation, does not yet appear; full details on Dr. Kandt's methods being not yet published. As regards the details of the lake contours, the new map is certain to mark an improvement on its predecessors, for, as already mentioned from time to time in the *Journal*, Dr. Kandt's survey was executed in the most painstaking way, an almost complete circuit of its shores being made on land, while the land work was supplemented by boat-journeys. The general outline of the eastern shore agrees well with that shown on Mr. Fergusson's map (*Journal*, January, 1901), though the minor indentations are shown in much more detail. The western shore differs to a greater extent, being considerably more broken than was shown by Mr. Fergusson, who, in the more rapid boat-journey of Mr. Moore's expedition, was naturally unable to examine all the bays to their heads. The island of Kwijwi also differs considerably in outline from its delineation on former maps. The publication of the full results of Dr. Kandt's researches will be awaited with much interest.

AMERICA.

Winds and Seiches on Lake Erie.—We referred some time ago (*Journal*, vol. xvi. p. 685) to Prof. A. J. Henry's study of the variations of level on Lake Erie as influenced by the wind. Prof. Henry has now published the full results of his researches in a *Bulletin* (J., 1902) of the United States Weather Bureau. The first part of the paper describes the physical characteristics of Lake Erie, and the prevailing winds; while the latter part describes the various classes of seiche observed, whether as the result of storms or occurring in fair weather. The prevailing winds are westerly, though the proportion varies at different seasons of the year, and at Cleveland south-easterly winds are more frequent than elsewhere. As regards the general theory of seiches, it is pointed out that in the case of a wind of sufficient strength to pile up the waters on the leeward shore, the lake tends to return to a state of stable equilibrium shortly after the maximum force has been exerted, even though the velocity of the wind may continue high for several hours longer. A series of rockings of the water of the whole lake takes place about a nodal line passing through its centre, the water at either end rising and falling alternately until a condition of rest is attained. In the case of Lake Erie the wind generally becomes sufficiently strong in the cold season, a day or so after the storm has passed, to overcome these rockings, but with light winds they will continue until equilibrium is restored. Seiches of great amplitude occur on Lake Erie only in connection with gales of 40 to 50 miles an hour, being due to the high winds from the west or south-west which usually come in the rear of the storm. During the year December, 1899—November, 1900 (for which charts showing the daily variations of wind-velocity and lake-level are appended to the paper), three storms occurred with velocities of 60 to 80 miles an hour, one being the great storm by which Galveston was wrecked, which caused a seiche of unusual magnitude for the summer months, when they are as a rule rare. The wind effect in this case seems to have been much the same as would be produced by a quick powerful blow on the lake surface, and the amplitude of the oscillation was 7 feet 2 inches. Easterly winds are rarely strong on Lake Erie, and the greatest lowering of the water by their means is probably between 5 and 6 feet, but it is an interesting fact that a relatively low easterly velocity will produce a well-marked seiche. There are numerous small fair-weather seiches, with an amplitude of 8 to 12 inches, which it is not always easy to trace back to their ultimate origin. The effects of wind and barometric pressure sometimes act conjointly, as a rise in pressure is felt first at the western end of the lake, while the wind at the same time shifts to westerly, high water being thus produced at the eastern end. *Rhythmic* gusts of wind also exercise a powerful influence, even though small in themselves. The period of oscillation of the larger seiches was found to be about 16 hours, while in the case of about eighty small ones, the average obtained was between 14 and 15, or somewhat shorter, though theoretically the time should be independent of the amplitude. The time as calculated from the formula, on the assumption that the mean depth is 50 feet, would be 18 hours, or considerably in excess of the truth. The occurrence of a dangerous seiche cannot be foretold many hours in advance, but probably in time to warn property interests at the ports affected.

The Submarine Valleys of the Californian Coast.—In spite of the attention which has been paid by many writers to the question of the origin of the Californian submarine valleys, experts still differ as to the final answer to be given. In January last some account was given in *Science* of the dredging work done last summer off this coast, it being stated by Prof. W. E. Ritter that one of the results had been to show that the bottom deposits of some at least of the valleys consisted in part of close in-shore material, which suggested to him the conclusion that the valleys are natural channels, through which currents flow, at times at least, from the shore outwards. In a more recent number of *Science* (April 25), Prof. E. W. Hilgard gives reasons which had led him to a somewhat similar conclusion, though on different grounds. His view, already put before a meeting of members of the United States Geological Survey a year ago, is that the majority of the submarine channels have been formed, or are at least kept open, by some cause now in operation, and that cause coastal currents. After briefly describing the character of the valleys, he gives in detail his reasons for rejecting both of the hypotheses which have hitherto found most support, viz. (1) that the valleys are structural in origin (as held by Lawson); (2) that they are submerged stream valleys (the opinion of Le Conte, Fairbanks, and Davidson). In particular he points out that the submarine valleys do not, as a rule, correspond in position to valley openings on the shore, and that even where such is the case, there is no concordance between the two in size, shape, or grade. No trace is visible of modification by the development of the submarine platform, or "continental shelf," but about one-half of the valleys extend quite up to the present shore-line, where they stop abruptly, this being, in Prof. Hilgard's opinion, the critical point in attempting an explanation of the valleys. The only cause capable of keeping them open close to the shore in the face of active cutting or deposition, would seem to be coastal currents, which might be either marine or else subterranean streams from the land, and, as favouring the latter explanation, the occurrence of an oil-well near the head of the Vicente valley is pointed to. Prof. Hilgard allows that all the valleys may not be due to the same cause, and urges the importance of a detailed geological study of the adjacent mainland.

Exploration in Alaska.—Since the publication of the article on 'Recent Exploration in Alaska' (*Geo. Jour.*, vol. xix. 1902, p. 609), a further report has been received of an expedition despatched by the United States War Department in 1899, under the command of Lieut. J. S. Herron, for the exploration of a direct and practicable route from Cook inlet, on the Pacific coast of Alaska, to the Yukon river. At the outset a small detachment of the expedition disembarked at Portage bay, Prince William sound, Alaska, for the purpose of exploring a route about 75 miles long from that point to Knik arm, Cook inlet. Much of the country traversed by the main expedition was previously unknown, and, in spite of many obstacles, useful information was acquired regarding the topographical features, available routes of travel, feasible routes for railroad construction, appropriate and available sites for military reservations, adaptability for agriculture and stock-raising, mineral resources, timber, fuel, food-products, and the stock best suited for transportation purposes; also the number, location, and condition of the natives of the territory explored. The Kuskokwim, the upper basin of which was crossed by the expedition, appears to be navigable for large river steamboats as far as the Echeatnu, and for small steamboats as far as the Tatlathno. The general characteristics of interior Alaskan rivers are strong currents, great erosion and sedimentary deposits, shifting channels, and rapid rise and fall in the spring. The rivers are open to navigation about June, July, August, and part of September. The range of mountains lying south-west of the Cantwell or Nenana river, which includes Mount McKinley and has hitherto been generally considered a part of the Alaskan range, appears to be in reality distinct, and has been designated the "McKinley range." In this range a second great mountain was discovered, 20,000 feet high, which was named Mount Foraker. The pass through the McKinley range, named by the author Simpson pass, opens a way to the Yukon, Kuskokwim, and Cape Nome countries, and was judged to be from about a quarter to about a half-mile in width. The largest and most important lake in this part of Alaska is Minchumina, situated close to the Kuskokwim, but drained into the Nitzutalina, thence into the Kontaithno (Toklat), a tributary of the Tanana. The route exploited pierces the centre of Alaska. It touches navigable points and winter trails on the most important river systems of Alaska, namely, the Suchitna, Kuskokwim, Tanana, and Yukon, and consequently taps the country drained by them, and connects with Cape Nome. The report contains a map of the route of the expedition, besides a number of illustrations.

Proposed Surveys in Alaska during 1902.—The active geological and topographical survey work, which has been carried out in Alaska by the United States Geological Survey since 1898, will be continued by various parties during the present year. An outline of the programme which has been laid down is given by Mr. A. H. Brooks, in the *National Geographic Magazine* for April last. Owing to the importance of South-Eastern Alaska from the point of view of mineral production, attention will be principally directed to this section of the country. Two parties are to continue the work done in 1900 in the Copper river basin, and it is hoped that the topographical map of the entire basin will be completed during the season, together with a geological reconnaissance of the greater part of it; the mutual relations of the copper belts north and south of the Mount Wrangell group being also defined. The mountain group just alluded to has been but little explored, and it is expected that geographical data of importance will be obtained respecting it. Another party, which will be under the leadership of Mr. Brooks, will devote its attention to the mountain ranges north of Cook inlet, which include Mount McKinley, whose base has not yet been reached. It is proposed to extend the survey to the Tanana and its goldfields, and, if possible, to strike across the unexplored region between it and the Yukon to Circle City. A party under Mr. A. J. Collier will make a special investigation of the coal areas on the Yukon; and a detailed survey of the Juneau mining district will be carried out by Mr. W. J. Peters. Mr. Brooks estimates that less than a sixth of Alaska has yet been surveyed, and this merely by reconnaissance work.

POLAR REGIONS.

Ice in the Arctic Seas, 1901.—From the report recently issued, we learn that the efforts of the Danish Meteorological Institute to gather information relative to the drift-ice in the Arctic seas have met with a fair amount of support during 1901. Adequate information has been received from the Arctic seas adjacent to the Atlantic, and some from Bering sea and strait; there is, however, a lack of data regarding the conditions in the sea north of Bering strait. The general results for 1901 may be summarized as follows: The western and eastern parts of the Kara sea were free of ice, but access from the west was difficult, the straits being blocked till late in the season. Normal conditions existed in Barents sea, while on the southern side of Franz Josef Land the state of the ice was favourable but difficult towards Novaya Zemlia and Spitsbergen. On the north and north-east coasts of Spitsbergen ice conditions were difficult, but favourable on the western coast. In East Greenland, and along the east coast of Baffin Land and Cumberland island, the winter ice remained till late in the season. Favourable conditions existed in Davis strait, Smith sound, and Bering strait. Icebergs were met with in the northern part of the Atlantic ocean far more to the east than for many years, mainly owing to the prevailing westerly winds. It is pointed out that the state of the ice in 1901 will probably have a very unfavourable influence upon the conditions round Iceland and Greenland in 1902. Six charts, showing the state of the ice in the Arctic seas during the months from April to September, 1902, illustrate the report.

Drift-ice in the Southern Ocean.—The statistics relating to the occurrence of drift-ice in southern latitudes during the last twenty years have been brought together by Herr Dinklage, in a recent number of the *Annalen der Hydrographie* (January, 1902). The writer enters into no discussion as to the causes of the variations in the amount of the ice observed, but for purposes of reference his carefully compiled lists will be of considerable value. He treats in turn of the South-Western Atlantic (including the Cape Horn region), the South-Eastern Atlantic and Indian oceans, and the Pacific, reviewing the state of the ice throughout the period in each of these successively. In the first-named region three well-marked maxima in the extent and duration of the drift are observable. The first occurred between April and October, 1892, and reached comparatively low latitudes, the most northerly position at which ice was observed being in 37° S., 26° 6′ W., though in 39° W., almost the same latitude was reached. From December, 1892, to June, 1893, a second great drift occurred, the ice-masses being still greater than on the previous occasion, and in the following summer again (September, 1893, to January, 1894) the same state of things recurred. In the second region again three maxima occurred, the first two of which followed, after intervals of about ten months, corresponding maxima in the South-Western Atlantic. The first occurred between September, 1893, and April, 1894; the second lasted from November, 1894, to July, 1895, or fully nine months; and the third and most important of all from June, 1896, to the end of March, 1897, or no less than ten months. It was marked also by the unusual easterly extension of the ice, and by the low latitude (for this part of the world) which was reached, viz. 41° 2′ S., in 51° 47′ W. In the Pacific Ocean the drifts were of less importance, with the exception of that of the second half of 1901. This was first observed during the first days of August, and lasted until the beginning of December. Advancing gradually eastwards, it extended in longitude from 150° to 102° W., and reached a latitude of 49° S.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Great Dust-fall of March, 1901.—The great dust-fall which took place on March 9 to 12 of last year in Northern Africa, Southern and Central Europe, was of quite exceptional magnitude as regards the area affected, at least as compared with those previously observed on land in Europe. It was exceptional too in the large amount of data available for its detailed study in the very numerous reports from the meteorological stations within the area of the fall. They have been worked up in the most thorough way by G. Hellmann and W. Meinardus, in a memoir issued by the Prussian Meteorological Institute (*Abhandlungen*, vol. ii. no. i.). As is pointed out by the authors in the introduction, such falls of dust have as a general rule been investigated solely from a mineralogical and microscopical point of view, so that the opportunity here afforded of studying the phenomenon from the standpoint of the meteorologist was not to be missed. In addition to the official meteorological reports, the authors received, in answer to a notice in the *Reichsanzeiger*, a large number of communications from private observers, not only from Germany and other European countries, but even from Africa, the replies being accompanied by samples of the dust in over a hundred cases. The memoir puts on record, firstly the descriptions received of the dust-fall in the several localities, and secondly the names of all the places at which it was observed, afterwards discussing the meteorological conditions prevailing at the time, and the composition and nature of the dust. A few pages are also devoted to the lesser fall of March 19–21. The main results of the investigation are summarised at the end. They show that the area of the fall extended from the Algerian Sahara to the islands of Southern Denmark, or through more than 25° of latitude, while isolated falls occurred besides in the Russian governments of Kostroma and Perm. Although interrupted by spaces on which no dust fell (*e.g.* a large part of Southern Germany), the area affected is reckoned at 300,000 square miles of land, to which must be added an area over half as great in the Mediterranean. The date of the beginning of the fall was regularly later from south to north, and the amount of the fall, as well as the size of the grains, decreased in the same direction, all of which facts are proofs of the African origin of the dust. In Algeria and Tunis the dust fell dry. The same was the case in part in Italy, though here the fall was also in the form of rain mixed with dust; while in Austria and further north, the phenomenon was associated throughout with ordinary atmospheric precipitation. The total weight of the dust which fell over Europe is roughly estimated at 1,800,000 tons, of which two-thirds fell south of the Alps. From its nature and composition, the dust—reddish or yellowish-brown in colour—is defined as an æolian deposit, described by some observers as formed by the finest ingredients of desert-sand, by others as loess. Volcanic ingredients are altogether wanting. Lastly, conclusions are drawn as to the meteorological conditions which prevailed at the time, stress being laid on the abrupt north-western boundary of the area affected, which shows that the air-masses on the two sides of it were heterogeneous in origin.

Geographical Factors in Bird-migration.—An interesting article on bird-migration in Europe and neighbouring regions appears in a recent number of the *Deutsche Rundschau für Geographie*, in which the author, Dr. Floericke, who has himself observed the migrations of birds in a great number of localities, and speaks with full personal knowledge of the subject, traces the influence of geographical and meteorological factors on the direction, times, and other conditions of the migratory flights. The subject is still obscure in certain particulars, but enough attention has been devoted to it to permit the main lines of migration to be defined with some accuracy, and this Dr. Floericke does on a map which accompanies the paper. It is perhaps not generally recognized that the flights of birds follow certain well-defined lines, not only across the Mediterranean—where the points of crossing are naturally determined by the southward extension of the three great peninsulas, since the birds always seek the shortest sea-passages, following a coast-line as far as possible—but on land as well. Mountain ranges stretching across the line of flight are avoided even at the cost of a considerable circuit, and where there is a well-defined gap between mountain systems, as, *e.g.*, that between the Carpathians and the mountains of Southern Germany, it is sure to be utilized. River valleys, such as those of the Rhine, Elbe, Oder, Danube, and Volga, also form natural bird-highways. Many lines of migration end as it were in a *cul-de-sac*, further advance being blocked by high mountains, and this determines the winter quarters of many species. The neighbourhood of Lenkoran at the south-west corner of the Caspian is such a spot, and here the birds of the northern tundras congregate in winter in almost incredible numbers. The most important foci in which the European lines of migration cross or unite, are Heligoland, Rossitten on the "Kurische Nehrung," Tangiers, and the Dobruja. Another important factor is the tendency of the various species to make for their original centres of dispersal, which causes some of the lines to run east-and-west rather than north-and-south. Erroneous ideas are prevalent as to the continuity of the flights, these being in reality performed in a leisurely way, with frequent intervals for rest or on account of unfavourable weather. The height at which they are made has also been much over-estimated. Of meteorological factors, the wind naturally exerts a great influence, flights being rarely made either during calms or strong winds, while for the passage of broad seas a favourable breeze is always waited for. Fog is a strong deterrent, as it hinders the necessary view of the country traversed. Temperature is the main factor in determining the dates of migration, while the moon exercises an unexpected influence, dark nights being preferred to moonlit ones.

GENERAL.

Geography at Oxford.—A revised set of regulations for the Oxford Diploma in Geography has lately been issued, and will presumably take effect in connection with the examination in June, 1903. No great change has been made in the general scheme, the chief alteration consisting in the abolition of the two classes under which the subdivisions were formerly grouped, all being now thrown into a single class. The first subdivision, regional geography (which, with general physical geography, now omitted as a special subject, formed the first class, to be taken up by all candidates), is still obligatory, but of the remaining subjects two only, instead of three, are now to be offered. A notice has also been issued with regard to the geographical scholarship, the examination for which will be held on Tuesday, October 14, 1902. Candidates, who must have taken honours in one of the Final Schools at the University, must send in their names to the Reader in Geography not later than October 1. Dryer's 'Lessons in Physical Geography,' George's 'Relations of Geography and History,' and Mackinder's 'Britain and the British Seas,' are taken as indicating the range of the examination, in which students of history and natural science in their geographical aspects will be specially considered.

OBITUARY.

Obituary of the Year.

The following is a list of the Fellows who have died during the year 1901–1902 (April 30):—

A. C. Allan; Hon. G. W. Allan; Emanuel de Almeida; Murray Bagshawe; C. A. Barclay; J. W. Batten; Robert Bayly; W. W. Baynes; D. W. Bell; A. M. Bethune; C. E. Biddulph; Colonel J. H. Bowker; A. A. Borradaile; Dr. Bretschneider; Arthur Cates; J. K. Child; H. W. Chomley; Lieut.-General Sir Andrew Clarke; Admiral Sir E. Commerell; Colonel E. H. Cooper; Colonel J. H. Cooper; H. M. Courage; Dr. Cranstoun; J. A. Cunningham; John Dawson; Sir J. P. Deane; Rev. H. M. Desmond; The Marquis of Dufferin; David Durell; E. J. Eyre; Earl Fitzwilliam; Edward Foa; Alexander Forrest; Rev. John Foulkes; W. Coutts Fyfe; Edward Gledhill; E. O. Goodinge; Rev. W. Green; Major E. L. Guilding; Colonel M. Hancock; Isaac Hardy; Sir G. D. Harris; Ralph Heap; Walter D. Heinemann; Somerville Helsham; Laurence Hindson; Sir Anthony Hoskins; F. W. W. Howell; George Hudson; T. F. Hughes; William Hughes Hughes; Arthur W. Jones; G. J. M. Kearton; The Earl of Kimberley; Hugh Leonard; William George Lock; Henry Martin; Sir L. W. Mathewes; Wm. Mathews; M. C. Maunoir; Prof. John Meiklejohn; Rev. John Milum; Rev. G. H. Nelson; Baron Santa Anna Nery; General D. J. F. Newall; Prof. A. E. Nordenskiöld; John Paddon; J. C. E. Parkes; E. W. Parsoné; Sir Cuthbert E. Peek; Major-General Pevtsoff; Dr. E. Prado; A. Pringle; Captain F. C. Quicke; T. Burnett Ramsay; Arnot Reid; J. R. Renton; H. B. Robinson; Vicomte Satgé de St. Jean; Dudley E. Saurin; Sir Sidney Shippard; H. M. Simons; Robert Swan; Sir Richard Temple; J. D. Thomson; C. J. Valentine; Colonel S. Vandeleur; General M. I. Venukoff; Rev. Thomas Wakefield; Colonel N. L. Walford; Lord Wantage; Henry White; Hamilton Willis; Sir F. W. de Winton; T. Graham Young.

CORRESPONDENCE.

On the Cartography of Lake Aral.

THE fourth number of the *Geographical Journal* contains a map of Lake Aral, which is a reduced copy of a map published at Tashkent in 1902. This map is a copy of Butakoff and Pospeloff's map compiled in 1848–49, upon which the observations of Berg's hydrographic expedition have been traced. As sole alteration, the mouths of the Syr-Daria have been laid down according to the survey executed in 1900 by Molchanoff.

Butakoff's map, though compiled more than half a century ago, may be considered one of the best existing. Its scale, 1 : 1,050,000, is a very large one, and the seashore is drawn with sufficient accuracy for a general map. It is only to be regretted that the longitudes of several points of the coast and of the islands seem not to be very satisfactory.

It is interesting to compare this map with most recent maps bearing the stamp of the Russian War Office, viz. the map of the Russian Empire in 8 sheets (1: 4,200,000); the map of Turkestan in 16 sheets (1 : 1,680,000); the map of the Transcaspian province, compiled from the latest information available at the topographical military section of the military circumscription of the Caucasus, under the superintendence of General Stebnitsky (1: 840,000); and last, the sheets 10 and 11 of the 27-sheet map of the frontier zone of the Russian Empire, compiled under the superintendence of General Bolsheff (1: 1,680,000).

All these maps differ greatly so far as the shore-line and the general position of the lake are concerned. As the discrepancies undeniably established on the maps are much too great to be imputable to the more or less skill of the draughtsmen in the reproduction of the contours of Lake Aral, it is more likely to suppose that different original sources have been made use of.

Unfortunately these sources have not been published, and it is thus quite impossible for us to choose, between the several positions assigned to Lake Aral, that which is the nearest to its true one.

Of the official cartographical publications mentioned above, the Bolsheff's map seems the most reliable, as much by its general appearance as by the authority of its editor in everything that concerns cartographical work. Notwithstanding, it does not agree with the astronomical and chronometrical observations made by Captain Solimani of the Russian General Staff. The observations executed by this geodesist from March 28 to August 14, 1873, have given Captain Ghedeonoff of the staff the opportunity for calculating the latitude and the longitude of sixteen points situated between Irghiz and Khiva, principally on the west coast of Lake Aral.*

The probable error, according to Captain Ghedeonoff himself, is $\pm 0^{s}{\cdot}15$ for the longitudes chronometrically determined, and $\pm 1''{\cdot}5$ for the astronomical latitudes.

The longitude of Irghiz serving as point of comparison for the longitudes was fixed by Colonel Tillo in 1868.

All the points fixed by Captain Solimani are shown on General Bolsheff's map, but, with the exception of Irghiz and Khiva, are all differently placed. Each point is shifted to the east according to a circular movement (rotation) round Khiva chosen as steadfast station.

The longitude of the furthest point from the centre of rotation, the *Well Kassarma*, differs on Bolsheff's map by nearly 18′ from the one determined by Solimani.

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* 'Memoirs of the Topographical-Military Section of the General Staff,' vol. xl St. Petersburg, 1885.

On the other hand, General Stebnitsky's map agrees with Captain Solimani's observations. On the north of Kassarma, Stebnitsky's map shows the coast of the Aral sea diverging more and more westwards. The difference of the most northern point on this map reaches 20′, 36 kilometres on that latitude, a very considerable discrepancy even for less explored countries than Lake Aral.

The frontier zone map, compiled at the War Office of St. Petersburg under the superintendence of General Bolsheff, seems to be executed with much care. It is, therefore, inadmissible that the draughtsman of this map has misplaced the coast of the Aral sea without good reasons. It is much more likely that Solimani's observations have been superseded by more recent information.

General Bolsheff, in shifting the coast of Lake Aral, may perhaps have been guided by the surveys, executed in a subsidiary manner during the Aralo-Caspian levelling, which were undertaken in 1874, under Colonel Tillo's superintendence, by Captain Solimani and MM. Moshkoff and Struve.

The surveys were made on the scale of 1 : 84,000. A single point on the coast of Lake Aral was reached by Colonel Tillo's expedition. This point is shown on both General Bolsheff's and the 1: 420,000 map accompanying Colonel Tillo's report on the aforesaid levelling in nearly the same longitude.

It may be of interest to mention that Colonel Tillo's report has been published in 1877, and that Solimani's astronomical and chronometrical observations, although made one year before he participated in the Aralo-Caspian levelling, have only been published by Captain Ghedeonoff in 1885.

If there is no other ground than the subsidiary survey executed in 1874 to alter the coast of the Aral sea, we would rather be inclined to maintain its situation as shown on General Stebnitsky's map.

A single word of explanation spoken by a competent person or authority detaining the original documents would alone and beyond all possible contestation solve a point which is of great consequence in the mapping of Central Asia.

D. AÏTOFF.

The Lung-kiang, Taiping and Kinsha Rivers.

In my paper "From Shanghai to Bhamo" (read January 13 last) I said (*Geographical Journal*, vol. xix. p. 271), "According to Bretschneider and Bianconi, the Lung-kiang rises further north than the Tai-ping Ho. This is probably a mistake, as it is a smaller river. So far as I can discover, no European traveller has seen the head of either."

The following letter, just received from Mr. H. Hayter Duff, shows that at least one European has been near the head of the Tai-ping, and that he believes that the Lung-kiang rises further north :—

"Sima, N.E. Frontier, Upper Burma.
"April 25, 1902.

"DEAR DOCTOR JACK,—

"I have to thank you for the very valuable and interesting paper you read before the Royal Geographical Society, which I received yesterday. May I be permitted to correct (?) or to draw attention to the remarks you pass on the Lung-kiang (Burmese Schwêli) and the Tai-ping? The sources of the Tai-ping were first approximately fixed by me in 1895. I have been within about 15 miles or so from them. The Schwêli, or Lung-kiang, is said by all the natives of these parts to rise north, some 10 to 15 miles or so, of the Tai-ping, and the hill in which they rise, the Mien Kwang Shan, was pointed out to me. It is possible, of course,

> that my information was wrong, and that the river-sources pointed out to me may have been the sources of another stream flowing into the Salwen, and that the Shwêli rises south again, as surmised by you. I have not seen Bianconi's 'Carte de la Chine,' but the most accurate one of these parts I have yet come across is 'Chine Meridionale et Tonquin' (Service Géographique des Colonies et M. Camille Guy, Chef de Service), par le Capitaine Friquegnon de l'Infanterie de Marine, which, if you have not got, would be worth, I think, looking at, though I expect Bianconi has largely made use of it. I was deeply interested in your paper, which contains so much that is new to me and to the world. I am hoping before long to be able to make a tour myself north of this and Teng Yueh. I was in Teng Yueh the other day for a week, and had a most pleasant time."

If the Tai-ping is really a smaller river than the Lung-kiang, I can only suppose that its apparently greater importance must have been the result of a flood when I crossed it. The Tai-ping certainly was muddy, while the Lung-kiang was clear.

I may take this opportunity of referring to Mr. W. R. Carles' letter on "The Kinsha River of West China" (*Journal*, vol. xix. p. 518).

That the Yang-tse, after reaching Shi-ku on a southerly course, takes a very sharp bend to the north-north-east, and keeps that course for many miles, I can testify, as I saw it with my own eyes. It is usual to refer to *the* "Peak of Li-kiang," as it is the only snowy peak visible from the city; but after having followed the Yang-tse up from Shi-ku to Chi-tien, I saw, from the pass between the Yang-tse and the Mekong, that the "Peak of Li-kiang" was the southmost and lowest peak of an unbroken range of snow-clad mountains extending northward for half a degree of latitude. The river cannot possibly get away to the east through this range. Amundsen saw it in 1899 not many miles south of Yung-ning (which he calls Yung-lin, the letters *l* and *n* being interchangeable in Chinese). See his paper (with map) in *Journal*, vol. xvi. p. 531. M. Bonin's observation, quoted by Mr. Carles, that the Yang-tse was met with one day's march from "Yun-ning-tou-fou," confirms Amundsen, or rather Amundsen confirms Bonin, who wrote before him. Finally, I crossed the Yang-tse, lower down, 16 miles south-east of Li-kiang, so that this remarkable bend of the Yang-tse must be approximately as shown in my map.

Mr. Carles is no doubt right in conjecturing that the "Pai-shui-kiang" is only a local name of the Yang-tse, and Szechenyi's map gives it as such. There is hardly a river in China which is not called "Pai-shui" (White Water) in some part of its course. I have seen scores of "Pai-Shuis," which are as common as "Sandy Creeks" in Australia. Any reach of broken foaming water is inevitably called "Pai-shui." The system of nomenclature is lamentable, and leads to confusion. The Chinese seem to have no idea of calling a river by the same name throughout its length. The Yang-tse itself is known locally as the Kin-sha (Golden Sand), as well as by a dozen other names.

Bonin's conjecture that the Ya-lung joins the Yang-tse "about 28° N. lat., instead of 26° 35', as has hitherto been supposed,"* is specifically disposed of by the fact that I traversed high land between the two rivers from lat. 28° to lat. 26° 40' (at Yung-peh). Szechenyi's map shows a road crossing the Ya-lung by a ferry, just above its confluence with the "Pej-suj Kiang" (Yang-tse) at "San-tuj-tsi," in lat. 26° 37′ N., and thence keeping up the left bank of the Yang-tse westward to "Sin-tchouang." On what authority this is set down I have been unable to ascertain, but it is probably very near the truth. My sketch-map is in error in giving a road from Yung-peh to the confluence of the two rivers on Szechenyi's route. I was also, as pointed out by Mr. Carles, wrong in marking the road from Yung-peh across the Yang-tse (here the Kin-sha) to Tali as Garnier's instead of Hosie's, the mistake having arisen from following the "China Inland" map, on which it is impossible to say where Hosie's route diverges from Garnier's.

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* As has already been explained in the *Journal*, the statement quoted was not M. Bonin's, but was based on the preliminary map published by the Paris Geographical Society on the first intimation of the discovery, and soon afterwards rectified by M. Bonin himself.

R. LOGAN JACK.

44, Dashwood House, New Broad Street, E.C., June 3, 1902.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1901-1902.

Anniversary Meeting, May 26, 1902.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

THE Secretary read the minutes of the last Anniversary Meeting.

ELECTIONS.—*Frank Percy Crozier, Lieut. Manchester Regiment; Edward Ratcliffe Garth Evans, Sub-Lieut. R.N.; Alfred Griffiths Grimley; Lieut.-Colonel Lewis Montgomery Murray Hall, I.S. Corps; Henry Kirke, M.A., B.C.L.; Harry Edward Norton; Major C. H. de Rougemont, D.S.O., R.A.; David Anderson Shennan; Captain Herbert W. S. Thorp (2nd King's Own Yorkshire L.I.); D. Ludwig Von Brann.*

The presentation of the awards then took place.

The PRESIDENT: General Sir Frederick Lugard is still in Africa, and is not able to be present. There can be no doubt, I think, that among the numerous military geographers who have thrown so much light during the last fifty years on the geography of tropical Africa, Sir Frederick Lugard certainly stands in the front rank. During nearly fifteen years that he has been at work in that continent, both on the east side and on the west, and while absorbed in military and administrative duties, he has never failed to show his active interest in geography. He has made surveys, drawn accurate maps, sometimes in minute detail, and sent home most valuable papers and reports; and now, since he has been in the important post of High Commissioner on the western side of Africa, he has never allowed a chance to pass of advancing the interests of our science. The Council, therefore, have no hesitation in presenting him with our Founder's Medal, and I believe I ought to add that our selection has received the approval of His Majesty the King.

The PRESIDENT, addressing Major Molesworth Sykes: The Council has awarded to you the Patron's Medal of the Society for your valuable geographical work in Eastern Persia, Seistan, and Baluchistan. A great deal of that work has been done in the field by yourself, and even more through your political influence, so that an enormous addition has been made to our accurate knowledge of that part of the world. And what I think enhances your merits, is that you have made yourself so completely acquainted with the previous history of that most interesting country. Nobody who has read your charming work as I have done, sitting up in bed even until two o'clock in the morning, can fail to see that you are not only intimately acquainted with the classical authors who have written on Persia, but with the Persian geographers as well as with the historians and poets, and you are also acquainted with all the old travels and narratives connected with that country from the time even of the Castilian Ambassador, Ruy Gonzalez de Elavijo, of the Brothers Shirley and Herbert, and old Jonas Hanway, and onwards to the present day. It is that minute knowledge of what has gone before you in that country which has enabled you to do that most interesting and valuable work for which we have now voted you this award. It was thus you were enabled to trace out, for instance, the periodical changes in the course of the Helmund; you have been able to elucidate better than ever has been done before the most interesting march of Alexander the Great; and you have also quite settled the question of the route of Marco Polo in Persia, so far as it can be ascertained. It is with great pleasure that I am now able to place in your hands the Patron's Medal, and I may mention that the selection of yourself for this honour has been submitted to the King, and has received his approbation. I may also mention that your medal is the first that will appear with King Edward VII.'s effigy upon it, and that the King has seen the medal and has given it his approval. I now place it in your hands with very great pleasure.

Major SYKES: Upon rising to return thanks, I would in the first place beg to express my deep gratitude to the Royal Geographical Society, not only for constant encouragement and support during the whole period of my travels, but for placing their entire resources at my disposal since my return from South Africa in October last. Any slight services that I have been able to render to the cause of geography and history in Persia have fully brought their own reward, for I count the happiest hours in my life to be those which I have spent on the summit of some unexplored peak, say the great volcano of Sarhad, or again, in discovering bronze weapons or ancient inscriptions, which have assisted me in my feeble endeavours to grope into the past history of Persia. You, sir, have referred to my recently published work, 'Ten Thousand Miles in Persia,' in terms which are most flattering, and of which I shall always be proud. My foremost aim and object in writing that book has been to lay before the British public an accurate account of Persia and the Persians, so that public opinion, so far as Persia is concerned, at any rate, may be based on accurate facts. If, in addition, as you were kind enough to say, my book is so interesting as to rob some people of their sleep at night, I think I may always feel very proud of that. In conclusion, sir, I beg to thank the Society for the beautiful medal which has been presented to me. The fact that it is the first to bear the effigy of his most gracious Majesty, King Edward VII., enhances it immeasurably in my eyes. My future plans are not settled, but I trust in the future to do more and better work than anything I have been able to accomplish in the past. I again thank you.

The PRESIDENT, addressing Mr. E. G. Ravenstein: When after the loss of our good Queen we feared that we should no longer be able to present the medal with her effigy upon it, we also bethought ourselves that it had long been desirable that there should be some recognition by this Society of those who excelled in geographical research, not to be presented necessarily every year, but only when some very deserving and illustrious geographer was proposed to us. It was, therefore, resolved by the Council that there should be a medal for geographical research to be called the Victoria Medal, and the Council had no hesitation in conferring the first of these medals upon you, mainly for your admirable work in connection with cartography during the last, I believe, half-century; certainly for more than forty years your name has been before the public as one of our leading cartographers. The history of cartography in this country in the last century will be indissolubly united with the name of Ravenstein. But it was felt you had been something very much more than a cartographer; your statistical investigations connected with geographical distribution have been most valuable, and I think I may say that your knowledge of the geographical literature of Africa is unequalled certainly by any one in this country. You have shown this in many ways, and most recently in the way you have edited the 'First Voyage of Vasco da Gama' and the travels of Andrew Battell. The Council, therefore, have no hesitation in selecting you to receive this medal. And for myself, personally, it is a source of much gratification that I should be the medium through which it is now presented to you.

Mr. Ravenstein: As an old Fellow of the Society of more than forty years' standing, I feel most sensibly the honour done me to-day. I am fully aware that among the distinguished explorers and geographers who have stood in my place in years gone by there are many whose lights will shine brightly long after my own shall have been eclipsed, or has become a mere memory. Yet I also feel, as your first Victoria Medallist, that I am not quite undeserving this medal, which I value all the more because it bears the portrait of our late beloved Queen. I sincerely hope that during the few years of labour which still remain to me, I may be able to turn out some work alike creditable to myself, promotive of the cause of geography, and justificative of this day's verdict of your President and Council. In times to come you will no doubt see before you Victoria Medallists of greater learning and greater talent than myself; but I believe you will never meet with one among them whose desire to work in the cause of that department of science for the cultivation of which the Society has been founded and which it is to cultivate, is greater than my own. I thank you.

The President: Mr. Stanley Gardiner, the Council has awarded to you the Murchison Grant in consequence of your valuable labours connected with the investigations in the Coral islands of Funafuti and afterwards in the Maldive groups. I have to present you with the diploma and with a portion of the grant which you wished to take this form.

Mr. Stanley Gardiner: Very few words of mine are necessary in expressing my great indebtedness to you for assigning to me this grant. I have long felt a strong admiration for the Society in view of the encouragement it has given, particularly to Oxford and Cambridge, in promoting geographical teaching and research. I hope we shall in the future more than justify the assigning of a grant to Cambridge, and that we shall create a school there. I trust, sir, that this Maldive expedition will be not the last, but the first, of a series of expeditions for studying the conditions of the ocean.

The President, addressing the Danish minister: Mr. Bille, I and the Council are extremely obliged to your Excellency for coming to receive the award of your countryman. I think it will interest you to know that the first publication, apart from our ordinary *Journal*, which was published by this Society was a translation of the work of your countryman, Captain Graah, on the east coast of Greenland. Since that day there has certainly been a long interval, but your countrymen have unostentatiously, but with admirable zeal and ability, as surveyors, pushed on their investigations along that coast. For a long time, as your Excellency is aware, it has been rather a blot on our maps of the world to see that long dotted line between the extreme point reached by Captain Graah and the discoveries of Captain Scoresby. I believe now, through the exertions of Danish naval officers, and especially of Lieut. Amdrup, who has made two important voyages on that coast, those dotted lines will no longer appear upon our maps, but that the discovery of the eastern coast of Greenland is almost completely finished. It is with very great pleasure that I deliver to you the diploma of Lieut. Amdrup and the piece of plate which is the form which he desired the award to take.

Mr. Bille: It is of course with great pleasure, and, after what Sir Clements has been good enough to say, not without a proper pride, that I accept the honour you have conferred upon my distinguished countryman. It is not the first time I have had the pleasure to come in this place to learn that the Royal Geographical Society, accustomed as it is to reward great undertakings, does not lose sight of those on a more modest scale, which are prepared with intelligence and care, and carried out, although unostentatiously and with small cost, still with courage and perseverance. And the pride I spoke of would consist in this, as Sir Clements has pointed out, that, thanks to the continued effort of twenty-five years, it may now be said that no arctic coast is better known or better mapped out than that of which Lieut. Amdrup performed the last and not the least difficult survey. I would add that it is by such endeavours small nations try to prove that they are amongst the living and not amongst the dying nations, and we are happy above all things to know that we have judges of the rank of the Royal Geographical Society to honour the claims we may bring forth.

The PRESIDENT: The Cuthbert Peek Grant has been awarded to Mr. J. P. Thomson, the founder of the Queensland branch of the Geographical Society of Australia, for the many excellent papers he has written on geography, and for his work in connection with the founding of that Society. We naturally have a very warm feeling for the colony of Queensland, for the colony of Queensland alone has subscribed to our Antarctic Expedition the sum of £1000, while all the other Australian colonies declined to give us anything; and I believe it is due a great deal to the President of the Society and to Mr. Thomson, and to their representations, that the Government of Queensland was induced to act so generously towards us. Sir Henry Norman has kindly undertaken to receive the award for Mr. Thomson, and to decide what form it shall take, and I therefore now have great pleasure in handing to Sir Henry Norman, the former Governor of Queensland, the diploma for Mr. Thomson.

Sir HENRY NORMAN: On behalf of Mr. Thomson, and at his particular request, I return you very hearty and sincere thanks for the honour that has been conferred upon him. And from my personal knowledge he deserves this reward, and I have no doubt whatever, Sir Clements, that why Queensland was the only colony that gave £1000 was owing to the great unpaid exertions of Mr. Thomson for many years past. I think perhaps you would like to hear that your estimation, sir, of Mr. Thomson is borne out by two little extracts which I will read. Mr. Hugh Nelson, the President of the Royal Geographical Society of Queensland, says, "The welcome news was cabled to the press here, and Mr. Thomson has requested you to receive the award on his behalf. When doing so, will you kindly express to the parent Society the extreme gratification the award has afforded to the Council, the Fellows and members of our branch. Such recognition by the highest authority in the world of the work of one of our members we greatly appreciate and esteem a very high honour, and I trust and believe it will be the means of stimulating all connected with our Society throughout Australia to make more strenuous exertions in furtherance of the science in which we are devoted, though humble, co-operators." I also received a letter from the Prime Minister of Queensland, in which he says, "In connection with this matter I have the honour to add my request that you will at the same time state on the part of this Government that it is a matter of great gratification to them that a member of its State has been thought worthy to receive this honour, and to express their appreciation of the recognition therein implied of the services rendered to science by a Queensland Society."

The PRESIDENT: The Council has awarded the Gill Memorial to Mr. Chisholm for his work in connection with geographical education. We all know how hard Mr. Chisholm has worked for now nearly a quarter of a century in promoting what this Council and what this Society has so long desired to see—a large improvement in the system of geographical education in the country. Mr. Chisholm has done this not only by his writings and text-books and atlases, but also by many courses of lectures, and I know that he is still actively at work doing the same most useful service. I have great pleasure in presenting you, Mr. Chisholm, with the diploma of the Gill Memorial.

The President then delivered his Anniversary Address (see p. 1).

Visitors then withdrew, and, the President having appointed Mr. B. H. Soulsby and Mr. E. E. Fagan scrutineers, the election of the Council for the ensuing year then took place. The honorary secretary, Major Darwin, read the report of the Council for 1901; this will be published in the Year-book for 1903.

The President then announced that the Council, as proposed, had been duly elected. The list is as follows, the names of new members, or of those changing office, being printed in *italics*:—

President: Sir Clements Markham, K.C.B., F.R.S., F.S.A. *Vice-Presidents:* *Colonel G. Earl Church*; Right Hon. Sir George D. T. Goldie, K.C.M.G.; Colonel Sir Thomas Hungerford Holdich, R.E., K.C.I.E., C.B.; Admiral Sir F. Leopold McClintock, K.C.B., D.C.L., F.R.S.; George S. Mackenzie, C.B.; *General Sir Henry W. Norman*, G.C.B., G.C.M.G., C.I.E. *Treasurer:* Edward L. Somers Cocks. *Trustees* Right Hon. Lord Avebury, F.R.S.; *Lord Belhaven and Stenton*. *Honorary Secretaries:* Major Leonard Darwin, R.E.; James F. Hughes. *Foreign Secretary:* Sir John Kirk, K.C.B., G.C.M.G., F.R.S. *Councillors:* Major-General Sir John C. Ardagh, K.C.I.E., C.B.; Prof. T. G. Bonney, LL.D., F.R.S.; *Admiral Sir James Bruce*, K.C.M.G.; Sir H. E. G. Bulwer, G.C.M.G.; *W. R. Carles*, C.M.G., F.L.S.; *Prof. J. Norman Collie*, F.R.S.; Colonel J. Cecil Dalton, R.A.; *Prof. E. J. Garwood*, F.G.S.; Admiral Sir R. Vesey Hamilton, G.C.B.; *D. G. Hogarth;* Colonel D. A. Johnston, R.E.; *Lord Lamington*, G.C.M.G.; Colonel Augustus Le Messurier, R.E., C.I.E.; L. W. Longstaff; *Colonel Sir Colin Scott Moncrieff*, R.E., K.C.M.G., C.S.I.; Howard Saunders, F.L.S.; General Sir Henry A. Smyth, K.C.M.G.; H. Yates Thompson; Admiral Sir Richard E. Tracey, K.C.B.; Colonel J. K. Trotter, C.M.G., R.A.; Colonel Charles Moore Watson, R.E., C.M.G.

THE ANNUAL DINNER.

In the evening, the President, Sir Clements Markham, presided over the anniversary dinner, which took place at the Whitehall Rooms of the Hôtel Métropole. Among those present (220 in all) were the Danish Minister, Admiral Lord Charles Beresford, M.P., Sir William Huggins (President of the Royal Society), Lord Colchester, the Bishop of Southwark, General Sir Henry Norman, Mr. Bryce, M.P., Admiral Sir J. Bruce, Sir William Robinson, Sir Henry Bulwer, General Sir Alfred Gaselee, Sir David Tennant, Sir Herbert Maxwell, M.P., Sir W. Lee Warner, Mr. W. E. Macartney, Mr. W. H. Wylde, Mr. George S. Mackenzie, Sir Henry Norbury, Major Molesworth Sykes, Sir J. Crichton Browne, Sir W. T. Thiselton Dyer, Sir W. Abney, Sir T. Trowbridge, Mr. Edgar Speyer, Mr. T. E. Fuller (Agent-General for Cape Colony), Mr. Frank Parish, Prof. J. Norman Collie, Colonel G. Earl Church, Prof. Ray Lankester, Sir E. Hertslet, Dr. Armitage, Colonel Dalton, Colonel Trotter, Colonel Houston, Master of Skinners' Company, Master of Mercers' Company, Dr. Larmor, Mr. Howard Saunders, Mr. Eaton, Colonel H. Lumsden, Colonel W. H. Sykes, Dr. Haddon, Mr. H. J. Mackinder, Mr. E. G. Ravenstein, Mr. C. Hawksley, Dr. Zimmermann, Mr. S. E. Spring-Rice, Mr. W. H. Shaw, Dr. H. R. Mill, Mr. J. J. H. Teall, Sir Augustus Adderley, Sir James Garrick, Colonel E. S. Milman, Captain Colbeck, Mr. Wm. Wallace, M. Schrader, Sir Horace Tozer, Sir Fowell Buxton, Mr. Christie, Dr. Gow, Mr. G. G. Chisholm, Mr. Kozui Otani, Mr. J.

Stanley Gardiner, Major L. Darwin, Mr. J. F. Hughes, Mr. E. L. S. Cocks, and the principal members of the staff.

The toast of "Our Patron the King" and "Our Vice-Patron the Prince of Wales" having been given by the PRESIDENT, Major LEONARD DARWIN proposed "The Army and Navy," Lord CHARLES BERESFORD responding for the Navy, and General Sir HENRY NORMAN for the Army.

The PRESIDENT proposed the toast of "The Medallists," which was responded to by Major SYKES and Mr. RAVENSTEIN.

The PRESIDENT then gave the toast of "The Royal Society," responded to by Sir WILLIAM HUGGINS, President R.S.

For the toast of "Success to the Relief Ship *Morning*," Captain COLBECK responded.

Sir HENRY BULWER then proposed "The Guests," for whom the Danish Minister, Mr. JAMES BRYCE, and Mr. T. E. FULLER responded.

. To the toast of "The President and the Society," proposed by Sir HERBERT MAXWELL, the PRESIDENT responded.

Thirteenth Ordinary Meeting, *June* 9, 1902.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

ELECTIONS.—*Frederick John Browne, C.E.; Percy B. Byass; George Cox; Captain Harold St. John Cruickshank, R.A.; Major-General James Lawtie Fagan, I.S.C.; Ernest Edward Harrhy; John Hopkins; Thomas Robert Maltwood; Captain Philip Maud, R.E.; Edmund Gustavus Meade-Waldo; Captain Horace Hayman Wilson (Lancashire Fusiliers).*

The Paper read was:—

"From the Somali Coast through Southern Abyssinia to the Sudan." By Oskar Neumann.

Fourteenth Ordinary Meeting, June 16, 1902.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

ELECTIONS.—*Archibald Edward Butter; Edward Smyth Crespin; Frederick Edwards; Lieut.-Colonel Henderson (Argyll and Sutherland Highlanders); Thomas Morland Hocken, M.D., F.L.S.; Captain Archibald O. Jenny (Cameronians); Robert Laidlaw; Major F. R. Lawrence, 14th Hussars, D.S.O.; John J. C. Lock; Colonel J. Morland (King's Royal Rifles); J. V. Ramsden, R.H.A.; Stephen William Miles Silver; Captain Arthur FitzHenry Townshend (4th Scottish Rifles).*

The Paper read was:—

"Geographical and Archæological Explorations in Chinese Turkestan." By Dr. M. A. Stein.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Adriatic Sea. *B.S.G. Italiana* 3 (1902): 324–339. **Bertolini.**

Per la storia della conoscenza scientifica del nostro paese. La direzione delle correnti fluviali e di riflusso in relazione alla corrente litoranea dell' Adriatico. (Leggi Scoperti dal dott. Geminiano Montanari, sec. xvii.) Nota del Prof. G. L. Bertolini.

On a seventeenth-century memoir by Dr. G. Montanari on the currents, fluvial and marine, of the coasts of the Adriatic.

Alps. **Penck and Brückner.**

Die Alpen im Eiszeitalter. Von Dr. Albrecht Penck und Dr. Eduard Brückner. Lieferung 2. Leipzig: Chr. Herm. Tauchnitz, 1902. Size 10½ × 7½, pp. 113–224. *Maps and Illustrations.*

Austria. *Rev. Scientifique* 17 (1902): 491–497. **Bellet.**

La navigation intérieure en Autriche-Hongrie. Par M. Daniel Bellet. *With Map.*

Austria. **Hackel.**

Die Besiedlungsverhältnisse des oberösterreichischen Mühlviertels in ihrer Abhängigkeit von natürlichen und geschichtlichen Bedingungen. Von Dr. Phil. Alfred Hackel. (Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Vierzehnter Band, Heft 1.) Stuttgart: J. Engelhorn, 1902. Size 9½ × 6½, pp. 78. *Maps.*

Austria—Dalmatia—Lagosta. *B.S.G. Italiana* 3 (1902): 198–214. **Martelli.**

L'isola di Lagosta (Dalmazia meridionale). Nota del socio dott. Alessandro Martelli.

Europe. *La G., B.S.G. Paris* 5 (1902): 247–254. **Cvijić.**

Les crypto-dépressions de l'Europe. Par J. Cvijić. *With Maps.*

A note on this appears in the Monthly Record (*ante*, p. 99).

Europe. *Jahresb. G. Ges. München* (1900–1901): liii.–lvi. **Ramann.**

Ueber den Einfluss des Klimas auf die Verwitterung, Bodenbildung und Pflanzenformation in Europa. Von Prof. Dr. E. Ramann.

Germany. **Schulz.**

Die Verbreitung der halophilen Phanerogamen im Saalebezirke und ihre Bedeutung für die Beurteilung der Dauer des ununterbrochenen Bestehens der Mansfelder Seeen. Von Dr. August Schulz. (Sonderabdruck a. d. *Zeitschrift für Naturwissenschaften*, Bd. 74.) Stuttgart: Schweizerbart, 1902. Size 9 × 6, pp. 431-457.

The author arrives at no definite conclusion beyond the fact that the lakes have been present, and have been constantly salt, since the second cool period of the Glacial epoch.

Germany. **Wüst.**

Ein interglacialer Kies mit Resten von Brackwasserorganismen bei Benkendorf im Mansfeldischen Hügellande. Vorläufige Mittheilung von Ewald Wüst. (Separat-Abdruck aus dem Centralblatt für Mineralogie, etc., 1902. No. 4.) Size 9 × 6, pp. [4]. *Presented by the Author.*

Germany—Harz. *Vierteljahrshefte G. Unterricht* 1 (1902): 122-128. **Kollbach.**

Eine Harz-Wanderung. Von Karl Kollbach.

Germany—Slavs. **Tetzner**

Die Slawen in Deutschland. Beiträge zur Volkskunde der Preussen, Litauer und Letten, der Masuren und Philipponen, der Tschechen, Mährer und Sorben, Polaben und Slowinzen, Kaschuben und Polen. Von Dr. Franz Tetzner. Braunschweig: F. Vieweg & Sohn, 1902. Size 9 × 6, pp. xx. and 520. *Maps and Illustrations. Price* 15*s.*

An interesting study of the past and present distribution of the Slav element in Germany, with notes on the types of settlements, dwellings, folk-lore, customs, songs and melodies, etc. The name "Vends" is discarded by the author as a race-name, on account of its original indefinite application to the Slav peoples in general on the German border.

Hungary *Földrajzi Közlemények* **28** (1900): 319-327. **Bartek.**

Jellemvonások hazánk földrajzából. Bartek Lajos.

On some geographical features of Hungary.

Hungary. *Abrégé B.S. Hongroise G.* 28 (1900), Nos. 1-4: 1-36. **Philippe.**

La vallée du Murány et la partie de la vallée du Garam comprise dans le département de Gömör. Extrait de l'article de son Altesse le Prince Philippe de Saxe-Cobourg-Gotha. (From *Földrajzi Közlemények* **28** (1900): 1-56. *Portrait and Illustrations.*)

Hungary—Budapest. *Abrégé B.S. Hongroise G.* **28** (1900), Nos. 5-10: 17-23. **Havass.**

Extraits de Monographies parues sur la ville de Budapest. Par Dr. Rodolphe Havass. (From *Földrajzi Közlemények* 28 (1900): 165-173.)

Hungary—Climate. *Földrajzi Kozlemények* **28** (1900): 269-283. **Hanusz.**

Eredetiségek hazánk Klimájában. Hanusz István.

On peculiarities in the Hungarian climate.

Hungary—Lowlands. *Abrégé B.S. Hongroise G.* **28** (1900), Nos. 1-4: 52-54. **Czirbusz.**

Die Entstehung des ungarischen Tieflandes. Von Prof. Dr. Géza Czirbusz. (From *Földrajzi Közlemények*, 28 (1900): 76-86. *Map.*)

This is noticed in the Monthly Record (*ante*, p. 99).

Hungary—Place-names. *Földrajzi Közlemények* **28** (1900): 243-252. **Etelvári.**

Helyneveinkről. Etelvári Alajos.

Hungary—Slovaks. *Abrégé B.S. Hongroise G.* **28** (1900), Nos. 5-10: 1-16. **Pechány.**

Das slovakische Volk in Oberungarn. Von Dr. Adolf Pechány. (From *Földrajzi Kozlemények*, 28 (1900): 145-165. *Illustrations.*)

Italy—Cartography. *Z. Ges. Erdk. Berlin* **36** (1901): 277-298. **Stavenhagen.**

Italiens Kartenwesen in geschichtlicher Entwickelung. Von W. Stavenhagen.

Italy—Sardinia. *Riv. G. Italiana* **9** (1902): 124-127. **Mori.**

La cima più alta della Sardegna. (Attilio Mori.)

See note in Monthly Record for June (p. 751).

Mediterranean—Sponge Fishery. **Flégel.**

Charles Flégel. La question des pêcheurs d'éponges de la Méditerranée. Conférence faite en séance de la Société Khédiviale de Géographie, le 1er Février, 1902. Le Caire, 1902. Size 9½ × 6½, pp. 24.

Northern Europe. *Globus* 80 (1901): 265–269. **Höfer.**
Der römische Handel mit Nordeuropa. Von P. Höfer. *With Illustrations.*

Northern Europe—Ice Age. *M.G. Ges. Hamburg* 17 (1901): 28–54. **Martin.**
Zur Frage der Stromrichtungen des Inlandeises. Von Dr. J. Martin.

Norway. **Holmsen.**
Isforholdene ved de norske indsjøer. Af Andreas Holmsen. Og Résumé français. Videnskabsselskabets Skrifter. I. Mathematisk-naturv. Klasse. 1901. No. 4. Christiania: Jacob Dybwad, 1902. Size 11 × 7, pp. 272. *Map and Diagrams. Presented by the Author.*

This is noticed at p. 98, *ante*.

Norway. **Spender.**
Two Winters in Norway: being an account of two holidays spent on Snow-shoes and in Sleigh-driving, and including an Expedition to the Lapps. By A. Edmund Spender. London: Longmans & Co., 1902. Size 9 × 6, pp. xiv. and 270. *Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

A readable account of two winter tours in Norway in 1900 and 1901. The author is enthusiastic in his praises of the country in its winter garb, and warmly recommends a visit to it at that season. He attended the National Winter Sports in 1900, and made his way to some districts off the beaten track, paying a visit to the "Fjeld" Lapps among their mountain haunts.

Russia. *Rev. G.* 50 (1902): 141–162. **Barré.**
Le peuplement et la colonisation de la Russie d'Europe. Par Paul Barré.

Russia. *Zemlevedenie* 8 (1901): 223–242. **Belski.**
The Petrovski Lakes of the Korchev district. By P. A. Belski. [In Russian.] *With Maps and Illustrations.*

Russia. *Zemlevedenie* 8 (1901): 29–206. **Shitkoff and Buturlin**
Through Northern Russia. By B. Shitkoff and S. Buturlin. [In Russian.] *With Maps and Illustrations.*

Russia—Magnetism. **Passalsky.**
P. Passalsky. Anomalies magnétiques dans la région des mines de Krivoï-Rog. Odessa: Société des travaux typographiques de la Russie Méridionale, 1901. Size 12½ × 10½. *Diagrams.*

Russia—Urals. *Zemlevedenie* 8 (1901): 207–222. **Ivchenko.**
Observations in the Southern Urals. By A. Ivchenko. [In Russian.]

Servia. **Mallat.**
La Serbie Contemporaine. Études, Enquêtes Statistiques. Par Joseph Mallat. 2 vols. Tome Premier: Géographie, Ethnographie, Histoire. Tome Second: Economie politique, sociale, commerciale. Paris: J. Maisonneuve, 1902. Size 9 × 5½, pp. vol. i. 374, vol. ii. 224. *Maps. Price* 12*s.*

A welcome compendium of information on one of the least-known countries of Europe.

Spain—Galicia. *Deutsche G. Blätter* 25 (1902): 50–74. **Schurtz.**
An der Riasküste Galiciens. Von H. Schurtz.

Sweden. *Ymer* 21 (1901): 374–387. **Nerman.**
Om farleden till Upsala och Fyris-åns reglering. Af Gustaf Nerman. *With Map.*

On the water-route to Upsala and the regulation of the Fyris-ån river.

Sweden—Historical. *Ymer* 21 (1901): 407–416. **Huss.**
Något om äldre Kamerala handlingars betydelse för geografisk forskning. Af Gunnar Huss.

On the importance of old financial documents from the point of view of historical geography.

Sweden—Lakes. *Ymer* 21 (1901): 388–406. **Ahlenius.**
Sjöforskningar i Lappland. Af K. Ahlenius. *With Maps.*

The writer's researches, which have also been published in German, have already been noticed in the *Journal* (vol. xviii. p. 616).

United Kingdom—England—Eastern Counties. **Ward.**
Thorough Guide Series. The Eastern Counties, with a practical section on the

Rivers and Broads. By C. S. Ward. Fifth Edition—Revised. London: Dulau & Co., 1902. Size 6½ × 4½, pp. x. and 144. *Maps and Plans. Price* 3*s.* 6*d. net. Presented by the Publishers.*

United Kingdom—England—Staffordshire. **Duignan.**

Notes on Staffordshire Place-names. By W. H. Duignan. London: Henry Frowde, 1902. Size 8 × 5, pp. xx. and 178. *Price* 4*s.* 6*d. net. Presented by the Publishers.*

An interesting contribution to the little-worked subject of English place-names. By reference to the early Saxon Chronicles the author succeeds in explaining many names which. in their modern forms, are hardly recognizable.

United Kingdom—Ireland. *T.R. Irish A.* 31 (1902): 579–730. **Westropp.**

The Ancient Forts of Ireland: being a Contribution towards our Knowledge of their types, affinities, and structural features. By T. J. Westropp. *With Plans and Plates.*

United Kingdom—Scotland—Glasgow. **McLean.**

Local Industries of Glasgow and the West of Scotland. Edited by Angus McLean. Glasgow: Local Committee of British Association, 1901. Size 8½ × 5½, pp. 288. *Diagram. Presented by the British Association.*

United Kingdom—Stonehenge. *J.R.I. Brit. Architects* 9 (1902): 121–136. **Blow.**

The Architectural Discoveries of 1901 at Stonehenge. By Detmar J. Blow. *With Plan and Illustrations.*

United Kingdom—Stonehenge. **Lockyer and Penrose.**
J.R.I. Brit. Architects 9 (1902): 137–142.

An attempt to ascertain the date of the Original Construction of Stonehenge from its Orientation. By Sir Norman Lockyer, K.C.B., and F. C. Penrose. *With Plan.*

ASIA.

Central Asia. **Novitski.**

V. F. Novitski. From India to Fergana. Account of a journey from the Panjab, through Kashmir, Ladak, Tibet, and Great Turkestan to Fergana. [In Russian.] St. Petersburg, 1899. Size 9½ × 6½, pp. 32. *Map. Presented by the Author.*

China. **Franke.**

Beschreibung des Jehol-Gebietes in der Provinz Chihli. Detail-Studien in Chinesischer Landes- und Volkskunde. Von Dr. O. Franke. Leipzig: Dieterich'sche Verlagsbuchhandlung, Theodor Weicher, 1902. Size 9½ × 6½, pp. xvi. and 104. *Map and Illustrations. Presented by the Publisher.*

An interesting study in regional geography. The Jehol district lies north-east of Peking, in the hilly borderland between China proper and South-East Mongolia, the former nomad inhabitants of which have in modern times been replaced by Chinese agriculturists. The work is based partly on Dr. Franke's personal observations, partly on a Chinese work published in 1830 (and itself to some extent based on an earlier memoir), entitled, 'Description of Chung-taw-fu,' and the author's object in writing it is to help towards the utilization of the extensive Chinese geographical literature by the aid of modern methods.

China. **Tiessen.**

China das Reich der achtzehn Provinzen. Von Dr. Ernst Tiessen. Erster Teil. Die allgemeine Geographie des Landes. (Bibliothek der Länderkunde, herausgegeben von Prof. Dr. Alfred Kirchhoff und Privatdoc. Dr. Rudolf Fitzner. Zehnter und elfter Band.) Berlin: Alfred Schall, 1902. Size 10½ × 7, pp. xii. and 426. *Map and Illustrations.*

A valuable summary of our knowledge of Chinese geography, evidently written with a wide acquaintance with the literature of the subject, and illustrated with well-chosen views showing types of Chinese scenery and forms of surface. A second volume will deal with the applied geography.

India. *Indian Antiquary* 31 (1902): 65–75. ——

Extracts from the Journal of Colonel Colin Mackenzie's Pandit of his route from Calcutta to Gaya in 1820.

Reprinted from the *Oriental Magazine and Calcutta Review* for 1823.

India. *J.S. Arts* 50 (1902): 334–355. **Waglé.**

The Industrial Development of India. By Nilkanth B. Waglé.

India—Assam. **Basu.**
The Cultivation of Plantains in the Assam Valley. (Agricultural Department, Assam. Bulletin No. 7. Vegetable Products Series No. 3.) Shillong, 1901. Size 11 × 6, pp. 16.

India—Bengal. *J.S. Arts* 50 (1902): 178-194. **Skrine.**
Bengal—the Land and its People. By F. H. Skrine.

India—Coal Resources. *J.S. Arts* 50 (1902): 371-407. **Dunstan.**
The Coal Resources of India, and their Development. By Prof. Wyndham R. Dunstan. *With Map.*

This was noticed in the Monthly Record for June (p. 752).

India—Earthquake. *M.G. Ges. Wien* 44 (1901): 312-318. **Diener.**
Ueber einige Wirkungen des grossen ostindischen Erdbebens am 12 Juni, 1897. Von Dr. Carl Diener.

India—Himalayas. **Burrard and Gore.**
Survey of India Department. Professional Paper No. 5. The Attraction of the Himalaya Mountains upon the Plumb-line in India. Considerations of recent data by Major S. G. Burrard. Published by direction of Colonel St. G. C. Gore. Dehra Dun, 1901. Size 11 × 9, pp. 115 and xii. *Maps and Diagrams.*

This important paper was noticed in the May *Journal* (p. 615).

India—Himalayas. *Petermanns M.* 48 (1902): 14-15. **Freshfield and Schlagintweit.**
Der Name des höchsten Berges der Erde. 1. Mount Everest oder Jomo-Kang-Kar. Von Douglas W. Freshfield. 2. Gaurisankar-Everest. Von Dr. Emil Schlagintweit.

India—Historical. *B.S.G. Lisboa* 18 (1900): 693-724. **Cordeiro.**
Bibliographia do Centenario da India. Por Luciano Cordeiro.

India—Sanskrit Language. **Fick.**
Praktische Grammatik der Sanskrit Sprache für den Selbstunterricht. Mit Uebungsbeispielen, Lesestücken und Glossaren. Von Dr. Phil. Richard Fick. Zweite Auflage. Wien: A. Hartleben. Not dated. Size 7 × 4½, pp. xii. and 184. *Presented by the Publishers.*

One of the useful series of Grammars brought out by the same publishers.

Indian Ocean—Maldive Islands. **Agassiz.**
An Expedition to the Maldives. By Alexander Agassiz. (Extract from a letter to Prof. E. S. Dana, dated Colombo, January 20, 1902.) Size 8½ × 5½, pp. 10.

See abstract in April *Journal* (p. 480).

Indian Ocean—Marion and Crozet Islands. *Rev. Colon.* 1 (1901): 239-246. **Sébille.**
Notice sur les îles Marion et Crozet. Par G. Sébille.

Japan. *J.G. Tōkyō G.S.* 13 (1901): 7-12, 93-102. **Kanahara.**
The Eruption of Adatara Volcano and the Subterranean Sounds of Mount Ransu. By Nobuyasu Kanahara. [In Japanese.]

Japan—Luchu Islands. **Yoshiwara.**
J. College Sci., Imp. University, Tōkyō 16 (1901): 1-67.
Notes of the Raised Coral Reefs in the Islands of the Riukiu Curve. By S. Yoshiwara. *With Maps and Plate.*
Geologic Structure of the Riukiu (Loochoo) Curve, and its Relation to the Northern Part of Formosa. By S. Yoshiwara. *With Maps.*

Kashmir. **Doughty.**
Afoot through the Kashmir Valleys. By Marion Doughty (Helton Mervyn). London: Sands & Co., 1902. Size 9 × 6, pp. xxxvii. and 276. *Illustrations. Price 7s. 6d. Presented by the Publishers.*

Contains some vivid descriptions of Kashmir scenery, and especially of the wealth of flowers, alpine and others, which render that country particularly attractive to the botanist.

Korea. *M.G. Ges. Hamburg* 17 (1901): 63-77. **Wolter.**
Korea, einst und jetzt. Von C. Wolter.

Malay Archipelago—Java. *Petermanns M.* 48 (1902): 44-45. **Du Bois.**
Die Keloet-Eruption vom 23 Mai, 1901. Von G. Du Bois.

Persia. *Asien* 1 (1901): 25–27. **Kersten.**
Bahnbauten in Persien. Von Leopold Kersten. *With Map.*

Philippine Islands. ———
Observations de Manila. Boletin Mensual, Año 1900. Manila, 1901. Size 13 × 9, pp. 254. *Diagrams.*

Russia—Siberia. *National G. Mag.* 13 (1902): 37–54. **Hill.**
A Trip through Siberia. By Ebenezer J. Hill. *With Map and Illustrations.*

Russia—Siberia. *G.Z.* 8 (1902): 81–92. **Stahl.**
Entlang der Sibirischen Bahn. Von A. F. Stahl.

Siam. **Campbell.**
Siam in the Twentieth Century: being the experiences and impressions of a British Official. By J. G. D. Campbell. London: E. Arnold, 1902. Size 9 × 6, pp. xii. and 332. *Map and Illustrations. Price* 16*s. Presented by the Publisher.*

A welcome addition to our knowledge of a country which is bound to become more and more involved in European politics. The author, who was recently Educational Adviser to the Siamese Government, gives a lucid sketch of the various aspects of the country and its people under the existing *régime;* and discourses on the international questions likely sooner or later to come to the front.

Tibet. **Sandberg.**
An Itinerary of the Route from Sikkim to Lhasa, together with a Plan of the Capital of Tibet and a New Map of the Route from Yamdok Lake to Lhasa. By Graham Sandberg, B.A. Calcutta: Printed at the Baptist Mission Press, 1901. Size 10 × 6½, pp. 30.

This is in part a compilation from published and unpublished reports of Indian explorers, in part based on private conversations with Tibetan natives. It is useful as presenting in small compass the latest information on the country traversed by the route to Lhasa. The plan is largely based on information derived from old residents.

Western Asia. **Belck.**
Beiträge zur alten Geographie und Geschichte Vorderasiens. Von Dr. Waldemar Belck. I. Leipzig: E. Pfeiffer, 1901. Size 9½ × 6½, pp. 56.

The author took part in the German Expedition to Armenia in 1898–99. Among the subjects discussed are the identification of Sanora of the Poutinger Table, and of places in Ancient Assyria and Armenia.

AFRICA.

Abyssinia. *B.S. Languedoc. G.* 25 (1902): 69–90. **Le Roux.**
Conférence de M. Hugues Le Roux.—Voyage au Ouallaga (Itinéraire d'Addis-Ababâ au Nil Bleu).

Abyssinia. *B.S.G. Com. Paris* 23 (1901): 553–561. **Michel.**
L'Ethiopie, Agriculture, voies de communications, avenir économique. Par M. Ch. Michel. *With Map.*

Africa. *Questions Dipl. et Colon.* 13 (1902): 480–492. **Hanotaux.**
L'Avenir de l'Afrique. Par G. Hanotaux.

M. Hanotaux considers that the future of Africa depends on the policy adopted by European nations, who must aim at *protection,* not *conquest,* of the natives.

Algeria. *Tour du Monde* 8 (1902): 205–216. **Vigerie.**
L'Oasis de Bou-Saada. Par M. le Docteur A. Vigerie. *With Illustrations.*

Algerian Sahara. **Flamand.**
Hadjrat Mektoubat ou les Pierres écrites, Premières Manifestations Artistiques dans le Nord-Africain, par G.-B.-M. Flamand. Lyon: A. Rey et Cie., 1902. Size 9 × 5½, pp. 48. *Illustrations. Presented by the Author.*

M. Flamand's own explorations have added to the number of known stations containing rock-inscriptions, the total being now nearly fifty for Southern Oran and the adjacent Sahara.

French Colonies. **Petit and Others.**
Les Colonies Françaises. Petite Encyclopédie Coloniale publiée sous la direction de Maxime Petit, avec la collaboration de MM. J. Alix, A. Baudrillart, etc.

Tome Premier. Introduction. Principes d'Organisation coloniale. Algérie. Tunisie. Sahara. Sénégal. Guinée. Côte d'Ivoire. Dahomey. Paris: Librairie Larousse. (Not dated.) Size 8½ × 6, pp. xxviii. and 772. *Maps and Illustrations. Price* 10*s.*

Contains a large amount of useful information on the history, economic value, statistics, etc., of the French Colonies.

French Congo. *Mouvement G.* **19** (1902): 175–179. **Kerremans.**

La Mambere et le bassin de la Kadei. Par Louis F. Kerremans. *With Map.*

M. Kerreman's survey has considerably modified the mapping of the Kadei or western upper branch of the Sanga (see note in the June number, p. 755).

French Congo. *Rev. Colon.* **1** (1901): 129–159. **Rousset.**

Rapport sur une reconnaissance faite à travers la brousse entre Port-Sibut (Krébédjé) et Bangui (Congo français). Par A. Rousset.

The journey was made early in 1901 by a new route between the Shari and Congo basins.

French Somali Coast. *Rev. Colon.* **1** (1901): 206–238. ——

Rapport ethnographique sur les populations de la Côte française des Somalis.

French Sudan. *Ann. G.* **11** (1902): 76–81. **Pierre.**

Sur le Haut-Oubangui. Voyage de Mr. Ch. Pierre, de la mission Bonnel de Mézières.

French West Africa. *Rev. Colon.* **1** (1901): 17–58. ——

Rapports sur le 3^e territoire militaire de l'Afrique occidentale française.

French West Africa. *Tour du Monde* **7** (1901): 529–624. **Gentil.**

La chute de l'Empire de Rabah (la Mission Gentil du Congo au lac Tchad). Par M. Emile Gentil. *With Map and Illustrations.*

German East Africa. *Miss. Catholiques* **34** (1902): 136–139, 152–154, 161–166. **Classe.**

Du lac Nyanza au lac Kivou. Par le R. P. Léon Classe. *With Illustrations.*

Account of a journey for the establishment of a mission of the Pères Blancs in Bugoye, the northern province of Ruanda.

German East Africa. **Fülleborn.**

Beiträge zur physischen anthropologie der Nord-Nyassaländer. Anthropologische Ergebnisse der Nyassa- und Kingagebirgs-Expedition der Hermann und Elise geb. Heckmann Wentzel-Stiftung, mit unterstützung der Stiftung herausgegeben von Dr. Friedrich Fülleborn. Berlin: Dietrich Reimer (Ernst Vohsen), 1902. Size 17½ × 12½, pp. 30, 64. *Plates and Illustrations. Price* 40*m. Presented by the Publishers.*

This splendidly got-up work supplies probably the most complete series of pictures of native African types that we yet possess from any single district. The letterpress gives a brief sketch of the anthropological data collected by Dr. Fülleborn, with tables containing very complete series of measurements made by him. While giving a far from pleasing impression of the natives from a physical point of view, the material thus presented cannot fail to be of value to the student of comparative anthropology.

German East Africa. *M. Deutsch. Schutzgeb.* **15** (1902): 22–28. **Kohlschütter.**

Einige vorläufige Resultate von Längenbestimmungen in Deutsch-Ostafrika und allgemeine Bemerkungen über Längenbestimmungen mit Hülfe des Mondes. Von Dr. E. Kohlschütter. *With Maps.*

The position of Ujiji was found to be in 4° 55′ 8″ S., 29° 40·2′ E., and of Tabora 5° 1′ 5″ S., 32° 48·7′ E., both co-ordinates of Ujiji being within a mile of those given by Mr. Fergusson.

German South-West Africa. *M. Deutsch. Schutzgeb.* **15** (1902): 17–21. **Streitwolf.**

Astronomische Breitenbestimmungen, angestellt im Jahre 1899. Von Oberleutnant Streitwolf.

Kamerun. **Hutter.**

Wanderungen und Forschungen im Nord-Hinterland von Kamerun. Von Franz Hutter. Braunschweig: F. Vieweg & Son, 1902. Size 10½ × 7, pp. xiv. and 578. *Maps and Illustrations. Price* 14*m. Presented by the Publishers.*

Although the material presented in this volume was collected by the author so far back as 1891–93, the book hardly suffers by the delay in its publication, owing to large amount of solid information of value put before the reader. The personal experiences are kept within moderate limits, while the larger half of the book treats of the physical features of the Kamerun, the natives and their languages, the climate, and so forth. The first section gives a useful summary of the history of exploration in the territory.

Kamerun. *Deutsch. Kolonialblatt* 13 (1902): 124-127. **Plehn.**
Reise des Regierungsarztes Dr. A. Plehn zum Studium einer lepraartigen Krankheit.

Madagascar. *Rev. Madagascar* 4 (1902): 219-224. **Grandidier.**
Dans le sud de Madagascar. Mission Grandidier. Par G. Grandidier. *With Map.*

A note on this journey was given in the Monthly Record for January (p. 90).

Madagascar. *Rev. Colon.* 1 (1901): 121-127. **Tantet.**
Une excursion en pays Antanosy au XVIII^{e} siècle. Par Victor Tantet.

Morocco. **Grove.**
Seventy-one Days' Camping in Morocco, by Lady Grove. London: Longmans & Co., 1902. Size 9 × 6, pp. xii. and 176. *Portrait and Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

A graphic narrative of a journey made last year from Tangier to the Atlas *viâ* the coast towns and Morocco City.

Nigeria. *Imp. I.J.* 8 (1902): 72-73. **Harford-Battersby.**
The Native Races of Nigeria. By C. F. Harford-Battersby.

North Africa—Historical. **Graham.**
Roman Africa. An Outline of the History of the Roman Occupation of North Africa based chiefly upon Inscriptions and Monumental Remains in the Country. By Alexander Graham. London: Longmans & Co., 1902. Size 9½ × 6, pp. xvi. and 326. *Maps and Illustrations. Price 16s. net.*

A solid contribution to the history of North Africa, of which the chief aim is "to trace as far as possible the extent of the Roman occupation, the degree of civilization attained in the first four centuries of the Christian era, and to show how conspicuous a part was played by North Africa in the building up of a great Empire."

Northern Nigeria. **Lugard.**
Northern Nigeria. Report for the period from January 1, 1900, to March 31, 1901. By the High Commissioner of Northern Nigeria, Brigadier-General Sir F. Lugard, K.C.M.G., etc. Colonial Reports, Annual No. 346. 1902. Size 9½ × 6, pp. 30. *Maps and Plans. Price 1s. 10d.*

Sahara. *Rev. Scientifique* 17 (1902): 272-273. **Lahache.**
Hydrologie du Sahara. Les eaux du Tidikelt. Par M. Lahache.

Sahara—Tuat. *Rev. G.* 50 (1902): 27-35, 107-126. **Vaissière.**
Le Touat. Par Commandant Vaissière.

South Africa—Historical. **Theal.**
The Beginning of South African History. By George McCall Theal. London: T. Fisher Unwin. 1902. Size 9 × 5¼, pp. xxvi. and 502. *Maps and Illustrations. Price 16s. Presented by the Publishers.*

This is an amplification, containing three times as much matter, of the same author's volume entitled, 'The Portuguese in South Africa,' which appeared in 1896 (cf. *Journal*, vol. ix. p. 324). It is based on Dr. Theal's researches, carried out since that date on behalf of the Cape Government, into the Portuguese manuscripts and early printed books relating to South-East Africa, many of which have been printed in the official publication, 'Records of South-Eastern Africa.' It is certainly the most complete general account of the early dealings of Europeans with South-East Africa that has yet appeared.

Togo. *M. Deutsch. Schutzgeb.* 15 (1902): 6-7. **Sprigade.**
Begleitworte zu der Karte der Umgebung von Misahöhe. (No. 1.) Von P. Sprigade. *With Map.*

The map is on the scale of 1:100,000 and embraces an area measuring some 30 miles by 25.

West Africa. *Mouvement G.* 19 (1902): 105-108. **Foret.**
Chez les M'Fangs. L'exploration du contesté Franco—Espagnol. Par A. Foret.

West Africa. *XXVII. Jahresb. V. Erdk. Dresden* (1901): 125-144. **Forwerg.**
Die Bewohner der Guineaküste. Von Rudolph Forwerg.

West Africa. **Marriott.**

The Secret Tribal Societies of West Africa. By H. P. Fitzgerald Marriott. (Reprinted from "Ars Quatuor Coronatorum" May, 1899.) Bound up with "A West African Tribe and its Secret Societies" (cutting from the *English Illustrated Magazine*, vol. xxii., pp. 570-577) and "Stone Implements on the Gold Coast" (from *Knowledge*, Nov. 1, 1900). Size 11½ × 8. *Presented by the Author.*

The author has brought together a large amount of information on the West African Secret Societies, in which he sees much that is worth preserving.

West Africa. **Sanders.**

Contribution to the determination of geographical positions on the West Coast of Africa. By C. Sanders. (K. Akademie van Wetenschappen te Amsterdam.) [Reprinted from Proceedings of the Meeting of Saturday, November 30, 1901.] Size 10½ × 7½, pp. 18.

Gives the latitude of Chiloango as 5° 12′ 4″ S., and the provisional longitude in time as 48^{m} $33{\cdot}9^{s}$ (12° 8′ 28″ E.). Corrections of the previously published co-ordinates of Ambriz and San Salvador are also given.

West Africa—Ostrich Rearing. *Rev. Colon.* 1 (1901): 97-120. ———

L'élevage des autruches dans l'Afrique Occidentale.

Describes the conclusions to be drawn from the recent experiments in ostrich rearing at Gumbu in Senegal, on the southern borders of the Sahara.

NORTH AMERICA.

Alaska. *National G. Mag.* 13 (1902): 81-85. **Georgeson.**

The Possibilities of Alaska. By C. C. Georgeson.

Alaska. **Herron.**

Explorations in Alaska, 1899, for an All-American Overland Route from Cook Inlet, Pacific Ocean, to the Yukon. By First Lieut. Joseph S. Herron. March, 1901. Washington, 1901. Size 9½ × 6, pp. 78. *Map and Illustrations.*

Lieut. Herron was detached from Captain Glenn's expedition of 1899 (cf. "Compilation of Explorations in Alaska," noticed in the May *Journal*, p. 609) to explore a route to the Yukon from Cook inlet. He recommends the route traced by him, which led by the headwaters of the Kuskokwim to the Tanana, as touching navigable points and winter trails of the most important river-systems of Alaska. The map is on the large scale of 6½ miles to the inch.

Alaska. *B. American G.S.* 34 (1902): 1-16. **Schrader.**

Recent Work of the U.S. Geological Survey in Alaska. By F. C. Schrader.

Canada—British Columbia. *J. Geology* 10 (1902): 182-185. **Gwillim.**

Glaciation in the Atlin District, British Columbia. By J. C. Gwillim.

Canada—Tides and Currents. **Dawson.**

Survey of Tides and Currents in Canadian Waters. By W. Bell Dawson. Ottawa, 1902. Size 10 × 6½, pp. 26. *Chart and Diagrams.*

CENTRAL AND SOUTH AMERICA.

Bolivia. **Ballivian.**

Noticia Politica, Geografica, Industrial y Estadistica de Bolivia. Datos para la consulta é información Comunicados á las Legaciones y Consulados de la República. Por M. V. Ballivian. La Paz, 1901. Size 8 × 5½, pp. 138. *Portrait. Presented by the Author.*

Bolivia and Brazil. *B.S.G. La Paz* 4 (1902): 51-61. **Ballivián.**

Informe de la Comisión Boliviana Demarcadora de Limites con el Brasil. Por Adolfo Ballivián.

Bolivia and Brasil. *B.S.G. La Paz* 4 (1902): 27-30. **Zambrana.**

Exploración del Yavary. Carta de Florian Zambrana.

Gives the co-ordinates of the source of the Yavary as obtained by the recent boundary commission and previous exploring expeditions, the values now accepted being 7° 6′ 55″·3 S., 73° 47′ 30″·6 W.

Brasil—Amazon. *Deutsch. Rundschau G.* 24 (1902): 204-210, 265-270. **Lamberg.**

Das Amazonasgebiet. Von Moriz Lamberg. *With Illustration.*

Brazil—Rio Grande do Sul. **Funke.**
Deutsche Siedlung über See. Ein Abriss ihrer Geschichte und ihr Gedeihen in Rio Grande do Sul. Von Alfred Funke. Halle a. S., Gebauer-Schwetschke Druckerei, 1902. Size 9 × 5½, pp. 80. *Map. Presented by the Publisher.*

A useful summary of the present condition and prospect of the German colonies in Rio Grande do Sul.

Nicaragua Canal. *Petermanns M.* 48 (1902): 25–30. **Sapper.**
Der Bericht der Nikaraguakanal-Kommission von 1897–99. Von Dr. Karl Sapper. *With Map and Profiles.*

Paraguay—Indians. *J. Anthrop. I.* 31 (1901): 280–299. **Hawtrey.**
The Lengua Indians of the Paraguayan Chaco. By Seymour H. C. Hawtrey. *With Plates and Sketch-map.*

An account of a little-known tribe.

Peru—Indian Tribes. **Markham and Ballivian.**
Sociedad Geográfica de La Paz—Bolivia. Las posiciones geográficas de las tribus que formaban el Imperio de los Incas con un "Apéndice" Sobre el nombre Aymara por Clemente R. Markham C.B. Versión castellana precedida de una introducción por Manuel V. Ballivián. La Paz, 1902. Size 9 × 6½ pp. 120 and xviii.

South America. *B. Bureau American Republics* 12 (1902): 346–362. **Reyes.**
Exploration of Unknown Regions in South America.

Report of an address delivered by General Don Rafael Reyes at the Pan-American Congress of 1901, describing his early explorations in the Amazon basin, with remarks on the future development of that region.

South America. *Petermanns M.* 48 (1902): 1–9. **Stübel.**
Uber die Verbreitung der hauptsächlichsten Eruptionszentren und der sie kennzeichnenden Vulkanberge in Südamerika. Von Dr. A. Stübel. *With Map.*

Tierra del Fuego. *Tour du Monde* 8 (1902): 13–60. **Nordenskjöld.**
La Terre de Feu, d'après M. Otto Nordenskjœld, résumé et traduit par M. Charles Rabot. *With Map and Illustrations.*

Venezuela—Historical. **Hassert.**
Beiträge Kolonialpolitik 3 (1901–1902): 297–317.
Die Welserzüge im Venezuela. Das erste deutsche überseeische Kolonial-Unternehmen im 16 Jahrhundert. Von Prof. Dr. Kurt Hassert.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. **White.**
Across Australia, being the Diary of a Journey from Port Darwin to Adelaide during June, July, August, 1901. By Right Rev. Gilbert White, Lord Bishop of Carpentaria. Size 8 × 4½, pp. 36. *Portrait and Maps.*

Australia—Timber Resources. *J.S. Arts* 50 (1902): 533–550. **Scammell.**
The Timber Resources of the Australian Commonwealth. By Edward T. Scammell.

Marshall Islands. **Schück.**
Die Stabkarten der Marshall-Insulaner. Von A. Schück. Hamburg: H. O. Persiehl, 1902. Size 14 × 9, pp. 38. *Plates.*

This will be specially noticed.

New South Wales. **Andrews.**
Report on the Yalwal Gold-Field. By E. C. Andrews, B.A. 1901. (New South Wales, Department of Mines and Agriculture. Geological Survey. Mineral Resources, No. 9.) Sydney, 1901. Size 10 × 6½, pp. 46. *Maps, Plan, Sections, and Illustrations. Presented by the Department of Mines and Agriculture, New South Wales.*

Pacific. ——
Sailing Directions for the North-east parts of the Pacific Ocean. I. [In Russian.] St. Petersburg, 1901. Size 11 × 7½, pp. 356 and xxii. *Chart and Illustrations.*

Pitcairn Island. *Petermanns M.* 47 (1901): 225–230, 250–259. **Hermann.**
Die Bevölkerung der Insel Pitcairn als Gegenstand wissenschaftlicher Untersuchung. Von Dr. Rudolph A. Hermann.

Sketches the history of the Pitcairn islanders from existing sources of information.

12, 13; XXXV. 1, 12; XXXVI. 3, 4; XXXIX. 6, 9, 10; XL. 11. **Somerset,** LXXXV. 2. **Staffordshire,** XLIII. 2, 3, 6, 11; L. 4, 7, 8, 11, 12, 15, 16; LI. 1, 2, 3, 4, 5, 11; LII. 1, 2, 4, 6, 7, 8, 9, 10, 11, 12, 14, 16. **Worcestershire,** XLVIII. 12 (Areas of Bredon, Bredon's Norton, and Overbury Parishes only), 15, 16; LIII. 8 (Areas of Redmarley D'Abitôt Parish only), 11, 12 (Areas of Eldersfield, Pendock (Det.) and Redmarley D'Abitôt Parishes only); LIV. 13; LV. 2, 3, 4, 5 (Area of Bredon Parish only), 6, 8, 10, 12, 16. **Yorkshire,** CCC. 10, 15. 3*s. each.*

(E. Stanford, London Agent.)

England and Wales. **Bartholomew.**

Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheet 7: York and Scarborough. Edinburgh: John Bartholomew & Co. *Price* 2*s. Presented by the Publishers.*

Germany. **Sicker.**

Karte von Ost-Preussen unter Mitwirkung von Dr. Franz Zühlke, Dr. Alois Bludau und Dr. Albert Zweck, gezeichnet von Georg Sicker. 4 sheets. Scale 1 : 300,000 or 4·7 stat. miles to an inch. Stuttgart: Hobbing & Büchle, 1901.

The physical features of this most interesting part of Europe are clearly brought out on this map. Relief is shown by a carefully arranged series of six different tints and contours ranging from sea-level to over 300 metres, whilst the lakes and sea are coloured brown.

Grecian Archipelago. **Philippson.**

Die Insel Mykonos. Von Prof. Dr. Alfred Philippson. Scale 1 : 300,000 or 4·7 stat. miles to an inch. Geologische Karte der Insel Mykonos. Scale 1 : 300,000 or 4·7 stat. miles to an inch. *Petermanns Geographische Mitteilungen,* Jahrgang 1902, Tafel 10. Gotha: Justus Perthes. *Presented by the Publisher.*

Historical Atlas. **Poole.**

Historical Atlas of Modern Europe, from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World connected with European History. Edited by Reginald Lane Poole, M.A., PH D., Fellow of Magdalen College, and Lecturer in Diplomatic in the University of Oxford. Part xxix. Oxford: The Clarendon Press. London, Edinburgh, Glasgow, and New York: Henry Frowde, M.A. Edinburgh: W. & A. K. Johnston, 1902. *Price* 3*s.* 6*d. Presented by the Clarendon Press.*

Part xxix. contains the following maps:—No. 6, Europe at the time of the Third Crusade, by the editor. No. 43, Germany, 1815–1897, by C. Grant Robertson, M.A. No. 50, Scandinavia in the thirteenth century, by W. A. Craigie, M.A. As usual, the maps are accompanied by letterpress. This useful historical atlas is now fast drawing near completion, only two more parts remaining to be published.

River Thames. **Darbishire & Stanford.**

The Oxford River. Darbishire and Stanford's Map of the Thames from Northmore to Day's Lock. Scale 1 : 126,720 or 2 stat. miles to an inch. Oxford: Darbishire and Stanford. *Presented by the Publishers.*

A useful little map of the Thames in the neighbourhood of Oxford, extending from Northmoor to Day's Lock. It is folded for the pocket, and has been prepared especially for the use of tourists and excursionists on the river, for whom the map and the accompanying notes will be valuable. The notes give information concerning distances, locks, boats obtainable, inns, fishing, and other matters of a similar nature.

ASIA.

Tibet. **Obrutschew.**

W. Obrutschew's Aufnahmen im westlichen und zentralen Nan-schan. Nach dem russischen Original reduziert auf den Masstab 1 : 2,000,000 or 31·5 stat. miles to an inch. *Petermanns Geographische Mitteilungen.* Jahrgang 1902. Tafel 9. Gotha: Justus Perthes. *Presented by the Publisher.*

AFRICA.

British Central Africa. **Intelligence Division, War Office.**

Africa (British Central Africa). Scale 1 : 250,000 or 3·9 stat. miles to an inch. Sheets: (Provisional) 111-F. Fort Manning; (Provisional) 111-G, Mwera;

(Provisional) 111-H, South Nyasa; (Provisional) 111-K, Dedza Boma; (Provisional) 111-L, Mlangeni; (Provisional) 111-O, Kirk mountains; (Provisional) 111-P, Blantyre; (Provisional) 117-D, Chiromo; (Provisional) 117-H, Sena. 1901. *Price* 1*s*. 6*d*. *each*. London: Intelligence Division, War Office. Stanford. *Presented by the Director-General of Mobilization and Military Intelligence.*

These sheets include the course of the river Shire, and that portion of British Central Africa extending from the Zambezi to Blantyre, and the southern end of Lake Nyasa. They are only provisional issues, and many blank spaces occur, evidently for the want of trustworthy material; but these will be filled up as further information is forthcoming. The sheets have been reproduced from a map supplied by the Chief Surveyor of British Central Africa, and form part of the excellent general map of Africa which is now in course of preparation by the Intelligence Division of the War Office.

Egypt. **Kumm.**

Die Verbindungswege zwischen den Oasen Dachla und Charga. Von H. Karl W. Kumm. Scale 1:1,000,000 or 15·7 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1902. Gotha: Justus Perthes. *Presented by the Publisher.*

German East Africa. **Moisel.**

Karte von Deutsch-Ostafrika. Scale 1:300,000 or 4·7 stat. miles to an inch. Sheets G 6 Massassi and G 7 Mikindani. Bearbeitet von M. Moisel. Berlin: D. Reimer (Ernst Vohsen), 1901.

These two sheets include the country between the Rovuma river and lat. 10° S., and between long. 38° E. and the coast.

South Africa. **Juta.**

Juta's map of South Africa from the Cape to the Zambezi. Compiled from the best available Colonial and Imperial Information, including the Official Cape Colony Map, by the Surveyor-General, Cape Town, Dr. T. Hahn's Damaraland, and F. C. Selous' Journals and Sketches, etc. 2 Sheets. New and revised edition. 1902. Scale 1:2,534,400 or 40 stat. miles to an inch. Cape Town: J. C. Juta & Co. London: Edward Stanford. *Price* £1 1*s*

A new edition of this useful general map of South Africa is very acceptable just at the present time. The map appears to have been carefully revised and brought up to date, especially as regards railways and boundaries. The new boundary of Natal is laid down.

AMERICA.

Canada. **Surveyor-General's Office, Ottawa.**

Sectional Map of Canada. Scale 1: 190,080 or 3 stat. miles to an inch. Donald Sheet (90), West of fifth meridian. Surveyor-General's Office, Ottawa, 1902. *Presented by the Surveyor-General of Canada.*

GENERAL.

French Colonies. **Malleterre and Legendre.**

Atlas Colonial. Livre-Atlas des Colonies Françaises à l'usage de l'Enseignement, colonial en France et aux Colonies. Par G. Malleterre et P. Legendre. Paris: Libraire Ch. Delagrave. *Price* 7.50 *fr.*

This little atlas of the French Colonies consists of six parts, each of which can be obtained separately. It is intended for educational purposes, and in addition to the maps, which are somewhat crude, it is fully illustrated by photographic reproductions, and contains a very fair amount of descriptive letterpress.

World. **Stieler.**

Neue, neunte Lieferungs-Ausgabe von Stieler's Hand-Atlas, 100 Karten in Kupferstich 6 Lieferung. Sheets Nos. 61 and 77. Gotha: Justus Perthes. *Price* 60 *pf.*

Sheet No. 61 includes Turkestan, Afghanistan, Persia, Baluchistan, Transcaucasia, and North-West India. It is drawn on the scale of 1 : 7,500,000. No. 77 is the north-west sheet of a four-sheet map of Australia, on the scale of 1:5,000,000. Both are well executed and are quite new.

World. **Vivien de St. Martin and Schrader.**

Atlas Universel de Géographie. Commencé par M. Vivien de St. Martin et continué par Fr. Schrader. Sheet 18. Espagne et Portugal, Nord-Est. Paris: Libraire Hachette et Cie. *Price* 2 *fr.*

This sheet forms part of a four-sheet general map of Spain and Portugal, on the scale of 1 : 250,000. It includes the north-east portion of the country, with the Pyrenees and the adjacent part of France. Like most of the other maps of this atlas, it is beautifully executed, and it is only to be regretted that such slow progress is made with the work. There is an accompanying sheet of letterpress giving the sources of information consulted.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during March and April, 1902. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
31 m =	12·0 25	England, south coast:—Fowey harbour, Mevagissey harbour. 1*s.* 6*d.*
3168 m =	3·3	Scotland, west coast:—Eigneig More to Black Leversay. (Plans: —Peter's Port, Loch Carnan.) 2*s.* 6*d.*
3220 m =	2·8	France, south coast:—Cape Ferrat to Bordighera. 3*s.* 6*d.*
3219 m =	2·8	Italy, west coast:—Bordighera to Oneglia. 3*s.* 6*d.*
2097 m =	1·6 5·0	West Indies. Trinidad island:—Bocas de Dragos, Port of Spain. 2*s.* 6*d.*
3181 m =	6·0 4·5	China. Plans of Anchorages in the Yang-tse Kiang:—Silver island, Wuhu anchorage. 1*s.* 6*d.*
3182 m =	5·9	China. Plans in the Yang-tse Kiang:—Havoc and Ella rocks, Lee rocks, King kau rocks. 1*s.* 6*d.*
3183 m =	5·9	China. Plans in the Yang-tse Kiang:—Mopanshih, Chenglin reach. 1*s.* 6*d.*
3225 m =	1·42	Japan:—Simonoseki strait to Maruyama Zaki. 2*s.* 6*d.*
3169 m =	0·14	Australia, south coast:—Port Phillip to Gabo island. 2*s.* 6*d.*
1416 m =	var.	Anchorages on the north-west coast of New Guinea. 2*s.*
3269 m =	var.	North Pacific ocean:—Plans in the Gilbert islands. 1*s.* 6*d.*
369		Plans in the Cape Verde islands. Plan added:—Port Ponta do Sol.
1312		South America. Plans on the coast of Chile. Plan added:—Tongoi bay.
3031		Bays and anchorages on the east coast of Borneo. New plan:—Sangkulirang bay. Plan added:—Kaniungan islands.
2662		Celebes. Ports in Makassar strait. New plan:—Barito river.
2169		Islands in the North Pacific. New plans:—Midway island, Seward road and Welles harbour.
1490		North Pacific ocean. Harbours and anchorages in the Sandwich islands. New plan:—Kaunakakai harbour.

Charts Cancelled.

No.		Cancelled by	No.
2809	Silver island. Plan on this sheet.	New chart. Silver island and Wuhu anchorage	3181
1016	Corner inlet to Gabo island.	New chart. Port Phillip to Gabo island	3169
1416	Anchorages on north-west coast of New Guinea.	New chart. Anchorages on north-west coast of New Guinea	1416

Charts that have received Important Corrections.

No. 1934, England, east coast:—River Tyne entrance. 1626, England, east coast: —Blyth. 114A, Scotland, east coast, Firth of Forth:—St. Abb's head to Edinburgh. 126, Heligoland. 2310, Norway, sheet viii.:—Dönnœsö to Fleina. 2962, Arctic Russia:—North cape to Einsamkeit island. 2963, Arctic Russia:—Gulf of Ob. 144, Spain:—Gibraltar. 1400, Italy:—Castellamare bay, etc. 1233, Black sea:—Kustenjeh anchorage. 2235, Black sea, sheet vi.:—Fort Anakria to Kertch strait. 2686, St. Lawrence river:—Caraquette harbour. 411, Cuba:—Anchorages on the north coast. 1380, Cuba:—Nipe bay. 2859, San Domingo: Plans on the south coast:—San Pedro de Macoris bay. 589, British Columbia:—Esperanza and Nuchatlitz inlets. 386, Africa, west coast:—Princes, San Thomé, and Anno

Bom islands. 1235, Persian gulf:—Mouth of the Euphrates. 575, Bay of Bengal:—Madras to Ramiapatam. 2637, Celebes:—Strait of Makassar, south part. 2577, Philippine islands:—Between St. Bernadino and Mindoro, with adjacent islands. 2454, Philippine islands:—Northern portion of island of Luzon. 2809, China, north-east coast:—Yang-tse Kiang. 2849, China, sheet iv.:—Hankau to Yoh chau fu 2119, Australia, east coast:—Newcastle harbour. 1674, Australia, east coast:—Brisbane river.

Chile. **Oficina Hidrográfica, Valparaiso.**

Puerto Montt (No. 92). Scale 1:10,000 or 264 yards to an inch. Oficina Hidrográfica, Marina de Chile, Valparaiso. *Presented by the Director de la Oficina Hidrográfica, Valparaiso.*

North Atlantic Ocean and Mediterranean Sea. **Meteorological Office, London**

Pilot Chart of the North Atlantic and Mediterranean for June, 1902. London: Meteorological Office. *Price 6d.* *Presented by the Meteorological Office, London.*

United States Charts. **United States Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for May, 1902, and of the North Pacific Ocean for June, 1902. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Alaska. **Marsden.**

Twenty-four Photographs of the Yukon and Klondike rivers. By Maurice Marsden. Esq. *Presented by Maurice Marsden, Esq.*

These photographs, which have been presented by Mr. Marsden, supplement those noticed in the last number of the *Geographical Journal.* As will be seen by the titles, several of them represent mining scenes on the Yukon and Klondike rivers—

(1–6) Views of the Yukon river; (7) Progress of transportation methods in three years on the Yukon river; (8, 9) Watching the arrival of the first steamer with provisions arriving at Dawson City, Yukon river; (10) Indians on the banks of the Yukon river; (11) A miner's home on the Yukon; (12) Wood camp for river-steamers. Yukon river; (13) Healy Bar, 20 miles below Dawson city, on the Yukon river; (14) White Horse canyon, between Lake Le Barge and Marsh lake, headwaters of the Yukon river; (15) Eagle City, Yukon river; (16) Near Eagle City, Yukon river; (17) Eagle City (Fort Gibbons), United States boundary-line on Yukon river; (18) Eagle rock, Yukon river; (19) Miners on the banks of Yukon river near Rampart City; (20) Mouth of Klondike river, tributary of the Yukon river; (21, 22) Klondike river; (23) Dawson City; (24) Mouth of Hunker creek, tributary of Klondike river.

Egyptian Sudan. **Wilson.**

Thirty-two Photographs of the White Nile and Sobat rivers, taken by Captain H. H. Wilson. *Presented by Captain H. H. Wilson.*

Although small in size, many of these photographs are remarkably clear, and some of the subjects are of exceptional interest. The following is a list of the titles:—

(1) Shilluks (Fashoda); (2–7) Shilluk war dance (Fashoda); (8) Shilluk in war dance (Fashoda); (9, 10) Typical Shilluk (Fashoda); (11) Shilluks with Mek (King) Kour Wad Nedok (Fashoda); (12) "Hyæna" in Shilluk "Hyæna dance" (Fashoda); (13) Fashoda, old French fort, from the river; (14) Looking south up the backwater at Fashoda; (15) Teufikieh, Sir S. W. Baker's old station, 60 miles south of Fashoda; (16, 17) Dinkas, Sobat; (18, 19) Dinka sheikh, Sobat; (20) Dinka head-dress, Sobat; (21, 22) Anuaks, Sobat; (23) Anuak village, Sobat; (24) Sobat fort at junction of Sobat and White Nile (unoccupied); (25) Nasser fort, Sobat; (26) Pibor, 20 miles south of Akobo, looking south through Sudd; (27) Typical river-bank, Pibor, south of junction of Akobo; (28, 29) Nuers, Warratong, Pibor; (30) Nuers, Pibor; (31) Nuer "dug-out" canoe, Pibor; (32) Nuer sheikh, Warratong, Pibor.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

Queensland. ——

Annual Progress Report of the Geological Survey for the year 1900. [Brisbane, 1901.] Size 13 × 8½, pp. 28. *Map and Illustrations.*

Queensland. ——

The Year-Book of Queensland, 1902. Compiled by the Editor of the Year-Book of Australia. Size 8½ × 5½, pp. 200. *Map.*

Samoa. **Reinecke.**

Samoa. Von Dr. F. Reinecke. Berlin: W. Süsserott. [Not dated.] Size 8 × 5½, pp. 312. *Map and Illustrations. Price 5m. Presented by the Publishers.*

One of a most useful series of small handbooks descriptive of the German colonies. It gives, in a compact and handy form, all that the general reader is likely to wish to know about German Samoa, while at the same time supplying more special information on the physical geography, climate, the people and their mode of life, trade and agriculture, and other subjects.

Samoa and Guam—Bibliography. **Griffin.**

Library of Congress. Division of Bibliography. A List of Books (with references to periodicals) on Samoa and Guam. Compiled under the direction of A. P. C. Griffin. Washington, 1901. Size 11 × 7½, pp. 54. *Presented by the Library of Congress.*

South Australia. **Tomkinson.**

P.R.G.S. Australasia, South Australian Br. 4 (1901): 110–114.

Adventure in the First Steamer *Melbourne*, out of the Mouth of the River Murray, on August 20, 1854. By the late Hon. Samuel Tomkinson.

POLAR REGIONS.

Antarctic. *Ann. Hydrographie* 30 (1902): 215–224. **Schott.**

Die Wärmevertheilung in dem Wasser der Südpolaren Meere. Von Dr. Gerhard Schott. *With Diagram.*

Extracted from the scientific results of the *Valdivia* Expedition.

Antarctic—Belgian Expedition. **Arçtowsky and Renard.**

Les Sédiments marins de l'expédition de la "Belgica." Par Arçtowsky et A. Renard. (Extrait du *Bulletin de la Société Belge de Géologie*, etc. Tome xv. Année 1901. Procès-Verbaux, Séance du 18 juin 1901. Pp. 420–422.) Size 10 × 6½.

Antarctic—German Expedition. **Oberhummer.**

Jahresb. G. Ges. München (1900-1901): 99–133.

Die Deutsche Südpolarexpedition. Dritter Bericht der Geographischen Gesellschaft in München erstattet von Prof. Dr. Eugen Oberhummer. *With Plates.*

Antarctic—Ice. *Ann. Hydrographie* 30 (1902): 76-83. **Dinklage.**

Eistriften in südlichen Breiten in den letzten 20 Jahren. Von L. E. Dinklage.

See note in the Monthly Record (*ante*, p. 106).

Greenland. **Amdrup.**

Beretning om Skibsexpeditionen til Grønlands Østkyst. For Tidsrummet fra d. 14. Juni til d. 18. Juli og fra d. 12 September til d. 4. Oktober, 1900. Af G. Amdrup. Kjøbenhavn: Bianco Luno, 1902. Size 9½ × 6, pp. [44]. *Map and Illustrations.* (From the Meddelelser om Grønland, vol. xxvii.) *Presented by the Author.*

Describes the outward voyage of the *Antarctic* to Cape Dalton, and the return from Angmagsalik.

Greenland. **Amdrup.**

Beretning om Kystexpeditionen langs Grønlands Østkyst, 1900. Af G. Amdrup. Kjøbenhavn: Bianco Luno, 1902. Size 9½ × 6, pp. [86]. *Map and Illustrations.* (From the Meddelelser om Grønland, vol. xxvii.) *Presented by the Author.*

Describes the boat journey along the coast of King Christian IX. Land. A list of points astronomically determined is given.

MATHEMATICAL GEOGRAPHY.

Cartography—Bibliography. **Phillips.**

Library of Congress, Division of Maps and Charts. A List of Works relating to Cartography. By P. Lee Phillips. Washington, 1901. Size 10 × 7, pp. 90.

Reprinted from the 'List of Maps of America,' which forms one of the same useful series of bibliographies.

Geodesy. ——

Comptes-Rendus des Séances de la Trozième Conférence Generale de l'Association Géodesique Internationale réunie a Paris du 25 Septembre au 6 Octobre 1900. Rédigés par le Secrétaire perpétuel H. G. van de Sande Bakhuyzen. 1er volume: Procès-verbaux et rapports des Délégués sur les travaux geodésiques accomplis dans leur pays. Berlin and Leyden, 1901. Size 12 × 9½, pp. 298. *Charts and Diagrams. Presented by the Centralbureau der Internationalen Erdmessung.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Denudation. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **19** (1902): 266–295. **Baren.**

Over verweering en het ontstaan van bodemsoorten. Door J. van Baren.

Geomorphology. *Quarterly J. Geolog. S.* **58** (1902): 185–206. **Bonney.**

On the Relation of Certain Breccias to the Physical Geography of their Age. By Prof. T. G. Bonney, D.SC.

Geomorphology. *J. Geology* **10** (1902): 77–111. **Davis.**

Studies for Students: Baselevel, Grade, and Peneplain. By W. M. Davis.

The author points out that too many meanings have been attached to the term "base-level," and that some of them should be transferred to the other two of the above terms.

Geomorphology. *J. Geology* **10** (1902): 1–32. **Fenneman.**

Development of the Profile of Equilibrium of the Subaqueous Shore Terrace. By N. M. Fenneman.

Geomorphology. *Deutsch. Rundschau G.* **24** (1902): 241–246. **Neuber.**

Topisch-genetisch. Von A. Neuber.

Discusses the mutual relations of topography and the study of earth-forms from a genetic point of view.

Oceanography. **Arçtowski and Renard.**

Les sédiments marins de l'Expédition de la *Belgica*. Par Arçtowski et A. Renard. (Extrait du Bulletin de la Société Belge de Géologie de Paléontologie et d'Hydrologie. Tome xv. Année 1901. Procès-Verbaux, séance du 18 juin, 1901, pp. 420–422.) Size 10 × 6½.

Oceanography—Red Sea and Mediterranean. ——

Berichte der Commission für Oceanographische Forschungen. Collectiv-Ausgabe aus dem lxix. Bande der Denkschriften der Kaiserlichen Akademie der Wissenschaften. A. Forschungen im Rothen Meere. B. Forschungen im Östlichen Mittelmeere. Wien, 1901. Size 12 × 9½, pp. 504. *Maps, Plates, and Diagrams. Presented by the Academy.*

Phænology. **Ihne.**

Phänologische Mitteilungen (Jahrgang 1900). Von E. Ihne. (Sonder-Abdruck aus dem 34. Bericht der Oberhessischen Gesellschaft für Natur-und Heilkunde.) Size 9 × 6, pp. 28.

Physical Geography. *J.G.* **1** (1902): 62–69. **Davis.**

Field Work in Physical Geography. II. By Prof. W. M. Davis.

Phyto-Geography. *B.S. Languedoc. G.* **24** (1901): 157–192. **Flahault.**

Premier essai de Nomenclature phyto-géographique. Par G. Flahault.

An attempt to evolve a uniform system of nomenclature for both the geographical and the biological units which enter into the subject of plant-geography.

Water. *Globus* **81** (1902): 126–130, 143–147. **Ratzel.**

Das Wasser in der Landschaft. Von Friedrich Ratzel.

Traces the influence of the various forms of water on the landscape, from both the artistic and the morphological points of view.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. *B.S.R. Belge G.* 26 (1902): 5–27. **d'Alviella.**

Des Causes qui ont amené la Différenciation des Sociétés humaines. Par C^{te} Goblet d'Alviella.

Commercial Geography—Cocoa. **Preuss.**

B.S. d'Études Colon. 9 (1902): 53-134, 205-256.

Le cacao, sa culture et sa préparation. Par Dr. Paul Preuss. *With Illustrations.*

Commercial Geography—Gold. **Rankin.**

Prospecting for Gold. A Handbook of practical Information and hints for Prospectors, based on personal experience. By Daniel J. Rankin. London: Crosby, Lockwood & Son, 1901. Size 6 × 4, pp. viii. and 184. *Price 7s. 6d. net. Presented by the Publishers.*

There is a folding table giving a view of the characters by which mineral ores associated with gold are to be determined. Chapter iv. treats of "Gold in Africa."

BIOGRAPHY.

Casati. *Riv. G. Italiana* 9 (1902): 187–190. **Mori.**

Il Maggiore Gaetano Casati, del Attilio Mori. *With Portrait.*

General. **Wolkenhauer.**

Geographische Nekrologie für die Jahre 1900 und 1901. Von Prof. Dr. W. Wolkenhauer. (Aus H. Wagner's "Geogr. Jahrbuch," xxiv. Bd. 1901.) Size 8½ × 5½, pp. 371–396.

Hebenstreit and Ludwig. *M.V. Erdk. Leipzig* (1901): 1–87. **Grosse.**

Die beiden Afrika-Forscher Johann Ernst Hebenstreit und Christian Gottlieb Ludwig, ihr Leben und ihre Reise. Von Dr. Martin Grosse. *With Map and Portrait. Also separate copy, presented by the Author.*

A note on this will be given.

GENERAL.

Geography. *P.R.G.S. Australasia, South Australian Br.* 4 (1901): 53–67. **Eitel.**

Chinese Notions on Geography and Geomancy. By Rev. Dr. Eitel.

German Colonies. ———

Kolonial Handels-Adressbuch, 1902 (6 Jahrgang). Herausgegeben von dem Kolonial-Wirtschaftlichen Komitee. (Beilage zum "Deutschen Kolonialblatt." XIII. Jahrgang, No. 4.) Berlin: E. T. Mittler & Sohn. Size 10 × 6½, pp. 148. *Maps. Presented by the Publishers.*

Gives, besides the lists of Colonial mercantile firms, much useful information as to steamship lines, etc.

Hints to Travellers. ———

British Museum (Natural History). Suggestions as to Collecting and Preserving Fossils and Minerals (pp. 10).—Directions for Collecting and Preserving Plants (pp. 8).—Methods of Collecting and Preserving Various Soft-bodied Invertebrate Animals (pp. 16).—Instructions for Collecting Arachnida, Myriopoda, and Peripatus (pp. 4).—How to Collect Mosquitoes (Culicidæ) (pp. 14. *Plate*).—How to Collect Diptera (two-winged flies) (pp. 16. *Illustrations*).—Instructions for Collecting Insects (pp. 10. *Illustrations*).—Instructions for Collecting Reptiles, Batrachians, and Fishes (pp. 12).—Hints on Removing and Preparing Skins of Mammals (pp. 12. *Illustrations*).—Instructions for the Preservation of Birds (pp. 10. *Illustrations*). Size 8½ × 5½. *Presented by the British Museum (Natural History).*

This handy series of notes should prove of much assistance to travellers who may have the opportunity of collecting in out-of-the-way districts. Further information is offered to any one applying to the Secretary's office at the Museum.

Library Report. ———

Report of the Librarian of Congress for the fiscal year ending June 30, 1901. Washington, 1901. Size 10 × 6, pp. 380. *Illustrations. Presented by the Library of Congress.*

Missions. **Dennis.**

Centennial Survey of Foreign Missions. A Statistical Supplement to "Christian Missions and Social Progress," being a conspectus of the achievements and results of Evangelical Missions in all lands at the close of the nineteenth century. By the Rev. James S. Dennis. Edinburgh and London: Oliphant, Anderson, and Ferrier, 1902. Size 9¼ × 11, pp. xxii. and 402. *Maps and Illustrations. Price* 21*s. Presented by the Publishers.*

Contains an amount of statistical information with regard to foreign missions, the compilation of which must have entailed great labour and perseverance.

Portuguese Colonies. *B.S.G. Lisboa* **18** (1900): 411–609. **Macedo.**

As nossas riquezas coloniaes. Por José de Macedo.

Transliteration. *B. Comité l'Asie Française* **2** (1902): 112-117. **Vissière.**

Méthode de transcription française des sons chinois. Par A. Vissière.

Year-Book. **Keltie and Renwick.**

The Statesman's Year-Book. Statistical and Historical Annual of the States of the World for the Year 1902. Edited by J. Scott Keltie, with the assistance of I. P. A. Renwick. London: Macmillan & Co., 1902. Size 7 × 5, pp. xl. and 1332. *Maps and Diagrams. Price* 10*s*. 6*d. net. Presented by the Publishers.*

Among the special features of this volume are the recent census results for the whole world, illustrated by maps and diagrams; and maps of the new Indian frontier province, the American interoceanic canal schemes, and the Uganda railway and other projected lines in East Africa. The general information has been extended and revised throughout.

NEW MAPS.

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EUROPE.

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GLACIERS OF KANGCHENJUNGA.

GARWOOD.

H. Manly, lith

The

Geographical Journal.

No. 2. AUGUST, 1902. Vol. XX.

ON SNOW-WAVES AND SNOW-DRIFTS IN CANADA,*

WITH NOTES ON THE "SNOW-MUSHROOMS" OF THE SELKIRK MOUNTAINS.

By VAUGHAN CORNISH, D.Sc., F.G.S., F.C.S., F.R.G.S.

INTRODUCTION.

On December 5, 1900, I left England for Canada, accompanied by my wife, in order to study surface forms of snow. Our primary object, in this, was to continue the investigation of terrestrial surface waves and wave-like surfaces, without, however, confining our attention entirely to the study of such forms or motions of the snow as might be wave-like in character.

Our choice of Canada as the field for snow-study was determined to a great extent by the facilities for travel afforded by the Canadian Pacific Railway. The contrast between the hardship and exposure which attended the actual observations and the comfort of the well-appointed hotels and railroad cars was not the least remarkable of our experiences. All connected with the company with whom we came in contact welcomed us and gave us most effective help, and, in particular, we owe much to the kindly interest taken in our work by Sir Wm. Van Horne and Sir Thomas Shaunessey.

We arrived at Montreal on December 15, and remained in Canada until March 4, during which time scientific observations of snow were made on seventy-eight days.

The time-table was as follows :—

Montreal, December 15 to January 15.
Winnipeg, January 17 to 30.

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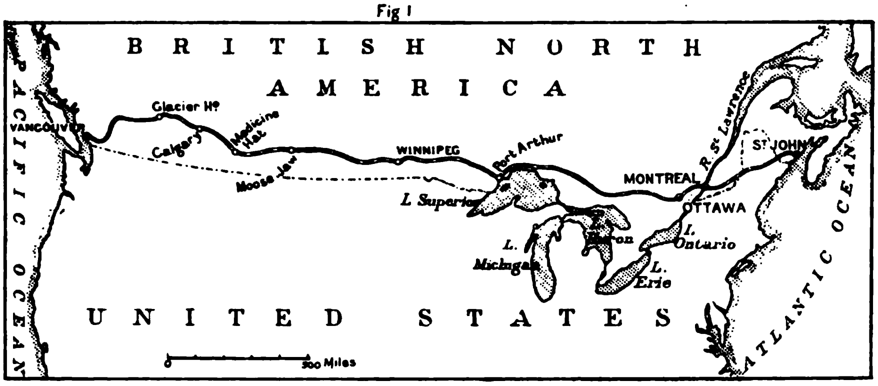
* Read in part at the Royal Geographical Society, May 12, 1902. The illustrations are from photographs and drawings by the author.

Glacier House, B.C., February 4 to 12.
Winnipeg, February 15 to 24.
Montreal, February 26 to March 4.

The intervals of travelling on the Canadian Pacific Railway were not the least instructive portion of the tour, for the snow-waves, etc., being passed in great number, the notion of typical forms was obtained by summation, in much the same fashion as one derives one's notion of the forms of waves at sea. Of course, the sight of *new* forms from the window or rear platform of a railway train may convey misleading ideas, but in this case the forms had been studied day by day in the course of snowshoe tramps, and their subsequent summation over hundreds of miles of snow-covered country was therefore not likely to mislead. The whole 3000 miles of country through which we passed was snow-covered, with the exception of a few miles near Vancouver, both on the outward and on the return journey (Fig. 1).

Fig I



SKETCH MAP OF ROUTE

Topographical Grouping of Snow-forms.

Of fresh-fallen snow there appear to be two chief kinds—wet and sticky snow, which falls about 32° Fahr.; and dry slippery snow, which falls at about 0° Fahr. or at any lower temperature.* The subsequent modifications of the snow appear to depend upon pressure, temperature, radiation and wind.

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* The following description of the characters of fresh-fallen snow and their relation to temperature is the best with which I am acquainted. The temperatures are given on the Centigrade system:—

"Schnee fällt in den Alpen und wohl überall am häufigsten zwischen +4° und −8° Schneefälle bis zu + 8° und bei −12° sind ausnahmweise auch schon beobachtet worden und offenbar auf starke Temperaturunterschiede der untersten Luftschicht, in welcher das Thermometer abgelesen worden ist, und der wenig höheren Schichten, in welcher sich der Schnee gebildet hatte, zurückzuführen. Der unter 0° fallende Schnee ist trocken, feinflockig, flimmernd, er besteht nur aus vereinzelten Eiskryställchen oder Drillungsgruppen derselben, aus kleinen ebenen Sternchen. Er ballt sich nicht, bleibt locker und leicht beweglich und hängt sich deshalb nicht leicht an Gegenstände und allzusteile Gehänge an. Fällt Schnee nahe an 0° oder darüber, so regelieren die sich berührenden Eiskrystalle zu zusammengesetzen Flocken, welche bis zu 5 cm.

In Canada there was a geographical distribution of the kinds of snow. Near Montreal it was, on the whole, only moderately dry, and during December did not differ very much from what we saw in Scotland, on the Pentland Hills and near Grantown-on-Spey, during February, 1900, except that the freshly fallen flakes did not cling together to form mottling and rippling.* The forms of the snow-drifts, or banks, in the neighbourhood of obstacles were not very dissimilar. The same general character of snow was observed as far west as Port Arthur, 1000 miles by rail from Montreal, the surface of the snow being generally soft. Near Winnipeg and westwards, at least as far as Medicine Hat, the appearance of the snow-banks accumulated in the neighbourhood of obstacles was strikingly different. Here the snow is almost perfectly dry, and the snowfall light. The prairie was often swept quite bare of snow in the neighbourhood of the banks, and the surface of the snow on the prairie was generally hard and rough. But for its whiteness the landscape resembled a desert with low isolated sand-hills more than a snow-scene in England. Much of this snow was granular, like sand, as the result of processes which it had undergone since its deposition.

On reaching the Rockies, the snow was seen to resemble more that of eastern Canada, but afterwards it became, apparently, still more moist, so that, in the next range, the Selkirks, we met with perfect examples of the forms which gravity imparts to moist snow. Throughout the whole 96 miles from Golden to Revelstoke, the deep snow took on what a mineralogist might term a reniform habit, and in the 10 miles on either side of Selkirk summit, from a little east of Bear Creek to a little west of Ross Peak Siding, the "snow-mushrooms," as the railway people call them, attained a really startling development.

Thus we saw in the prairies of Quebec and Ontario the forms of fairly dry snow with fairly heavy fall and a fair amount of wind, in a country with a moderate amount of tree shelter; in Manitoba and Assiniboia, the forms of cold, dry snow, with a small snowfall and much wind in a very open country; in the Selkirks, B.C., the perfecting and glorification of that class of snow-scene which from time to time delights our eyes in England, when a heavy fall of clinging snow clothes our trees and shrubs as with a winter foliage and fruit. In the Selkirk valleys the snow usually falls in large flakes in a calm atmosphere at a temperature near the melting-point. Although low temperatures are experienced, the surface snow does not, in these calm valleys, acquire the

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Durchmesser erlangen können. Der grossflockige Schnee flimmert wenig oder nicht, er ist schwerer, ballt sich und hängt sich überall an" ('Handbuch der Gletscherkunde,' von Dr. Albert Heim (1885), pp. 81, 82).

* See Appendix.

indurated and granular character so common on the open prairie. On the other hand, the great depth of snow—about 5 feet at the time of our visit—welds the lower layers into a compact and tenacious mass. Here the whole snowfall is not turned over and over by the wind, as on the prairie, where the snow which is exposed on the surface is often a material which has undergone compression by superincumbent snow, since removed.

Thus the snow near Winnipeg (Manitoba), and that near Glacier House, B.C., in the Selkirks, were found to be excellent examples of the opposite kinds, viz. dry and damp snow, the difference of surface forms being further accentuated by the fact that the former locality has a windy climate, and the latter a calm atmosphere. The snow-forms near Montreal, and for some hundreds of miles westward, are less perfect examples of those produced by wind acting upon dry snow.

At Winnipeg we have drift and erosion forms, succeeding one another in a horizontal sense; at Glacier House we have forms arising from excess or defect of deposition, viz. bosses and hollows, the latter often below the former when the boss or cap shelters the ground beneath, as by an umbrella.

Only a slight reference will be needed to the meteorological conditions at Winnipeg and at Glacier House in order to see how the opposite types of snow come to be so well represented at the two places. The Selkirks extract an enormous snowfall from the moist airs of the Pacific. Winnipeg, on the other hand, has not only a dry winter climate, but is so far to the east of the Rockies as to be beyond the region of the "chinook" winds, the extra warmth of which is the thermal equivalent of the precipitation on the west of the mountains. Thus the early snows at Winnipeg may remain on the ground all the winter, taking on forms and consistence very different from those of fresh snow. Westwards, in the ranching districts of the prairie, the "chinook" licks up the snow at intervals throughout the winter.

I now pass to the more detailed description of snow-forms, which involves in places a repetition, with amplification, of parts of the present section.

I say nothing here of the curious undulations produced by sledges upon the snow-covered roads of Montreal, as I hope to deal with them in another paper.

SNOW-"MUSHROOMS" AND OTHER BOSSES.

These are formed in moist snow, and were studied in the neighbourhood of Glacier House from February 4 to 12, 1901. Regular observations of temperature and snowfall are taken by the station-master; at the date of our visit the registered snowfall was 25 feet, and the depth of snow upon the ground was 5 feet. There was no sign of drift in the valley. According to the concurrent testimony of railway officials stationed here, most of the snow falls at or above 32° Fahr., so that, although zero weather is often experienced, the snow as it falls is adhesive. I was informed also that the air is usually calm during the snowfalls.

I was informed by three persons that a snowfall of 12 inches in an hour is not unknown here. I have never had the fortune to observe such a fall as this, but it must look as if the snowflakes occupied a large fraction of the total air-space. Nevertheless, as the rate of subsidence of the flakes is, I find, 2 miles per hour, the column of air of 1 square foot section which contains 1 cubic foot of snow is 2 miles, *i.e.* 10,560 feet high. It appears to be generally the case that the eye conveys an utterly misleading idea of the relative contents of a number of small particles and of the space in which they are distributed.

In the prairies near Winnipeg, rigid prominences stand out free from snow, at least on their upper and windward faces, but cause large detached drifts to accumulate in their neighbourhood, a small drift being also usually attached to the leeside of the obstruction. At Glacier House, on the contrary, the chief feature produced by the prominence is a concretionary growth based upon its upper surface, beyond which it ultimately extends with overhanging eaves. There is also sometimes a mass of snow attached to the windward side of the obstruction.

In the case of the drifts of the prairie snow, the prominence of the snow-banks is increased by the deficiency of snow to leeward of, and between the enclosing arms of, the snow-bank. In the case of the mushroom-like caps upon the tree-stumps at Glacier House, the associated depression is beneath, where the ground is sheltered as by an umbrella (Fig. 2).

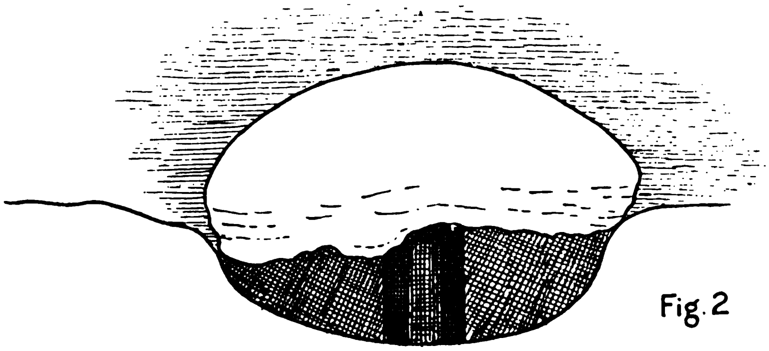

Fig. 2

Snow Mushroom with hollow beneath.
from a photograph.

In felling the trees a stump of several feet in height is always left, and this is the stalk of the "mushroom." When the stumps are short, the rim of the snow-cap touches the surrounding snow surface, and the appearance is then an ordinary boss instead of a "mushroom."

Heim describes * the formation of overhanging cornices of snow by the adhesion of the flakes of moist snow (at about 32° Fahr.) when eddying round in a wind on the lee side of an Alpine ridge. The bosses and caps on the tree-stumps at Glacier are so far similar to these snow cornices that their projecting eave is due to such adhesion. Their spheroidal shape, however, does not conform to active modelling by eddies. In one spot where the "mushrooms" were exposed to gusts of wind coming down a glacier valley, this fact was well illustrated by the remodelling of the spheroidal cap to a shape resembling that of a peg-top, but with edges meeting at the point.

The snow-mushrooms, as we saw them in February, appeared to have attained to perfect spheroidal symmetry as the result of a completed growth upon the circular platform of a cylindrical pedestal. (Fig. 3, Plate I.).

I proceed to give an account of the process of growth of the snow-mushroom, as inferred (*a*) from observation of the completed structure; (*b*) from my observations at various times of the occurrences during the fall of moist snow in Canada, Britain, Switzerland, and the Tyrol; and (*c*) from the probable operation of *regelation.*

Moist snowflakes adhere far better to a snow surface than to any other. When the wind is light, which is the case we have here to deal with, the snow surface remains rough, presenting many points for attachment, and perhaps diminishing the already small velocity of the air near the surface. Also there is no melting, such as sometimes hinders accumulation of snow upon foreign surfaces. But I expect that the most important factor in such concretionary growth is union by solidification of the films of moisture where the snowflake touches the snow surface.

The upper surface of this snowflake, which is exposed to the air, remains moist until another flake falls upon it, when, as I suppose, the surfaces in contact are united, as above, by a thin layer of ice, which is then a part of the structure of each snowflake.

The touching surfaces must be, in the first case, a very small fraction of the total area of surface of the snowflake. As the depth of the deposit increases, the pressure of the superincumbent layers slowly squeezes air out of the lower layers. These become more compact and more tenacious both by the filling up of interstices by repacking of material, and also by regelation.

When I attempted to detach a small snow-mushroom from its pedestal, I found that it was very firmly fixed. Having driven a long pole into the mass of snow, which was about 4 feet across, I found it to

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* 'Gletscherkunde.'

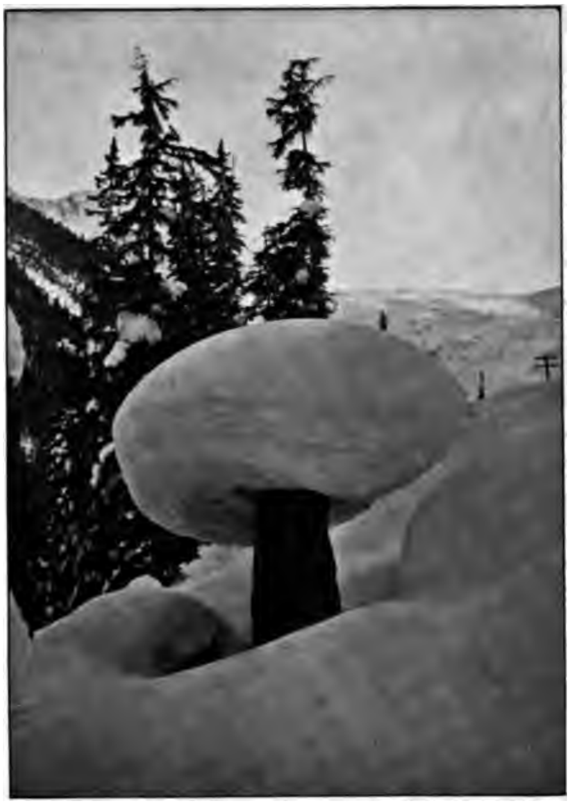

Fig. 3.

A SNOW MUSHROOM NINE FEET IN DIAMETER.

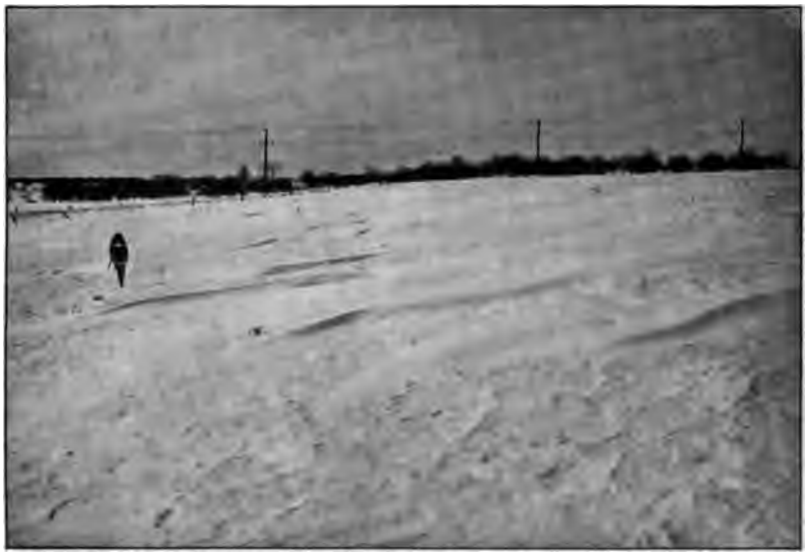

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Fig. 9.

MOVING SNOW-WAVES—TEMPERATURE 8° F.

be tough and tenacious, and I was unable to dislodge it. The pedestal was a broken, rotten, tree, about 1 foot in diameter and 12 feet high. Placing my pole against the tree, I gave successive pushes until the tree rocked violently, when at last the snow-cap fell, but as a whole, and it was not broken with its impact with the soft snow beneath.

Some concretionary action during deposition is usual in a quiet fall of snow in England, and when the flakes have ceased to fall, we see the rounded masses of snow clinging to, and weighing down, the twigs and branches of trees. As soon, however, as a breeze begins to make a stir amongst the branches, they shake off the greater part of their burden. Upon the rigid bases of posts, walls, railings, and tree-stumps the capping of snow is more stable, but with us in England the depth of the snow is not usually sufficient to weld the lower layers into a tenacious mass.

At Glacier House the mushrooms, on all but the largest tree-stumps, were probably as large as the pedestal was capable of supporting, *i.e.* the eaves of snow overhung the support as far as possible consistently with the limit of cohesion of the material and the size of the base. A stump 2 feet in diameter had a cap of snow 9 feet across, the eaves projecting 3 feet 6 inches all round the pedestal. The largest tree-stumps would probably have supported somewhat greater snow-caps had the depth of snow been greater; but, as well as I could judge, the projection of the eaves was as great as was consistent with the amount of snow which had fallen, and with the cohesion of the material. A broken tree with diameter of 4 feet had a snow-cap 12 feet across, the eaves projecting 4 feet beyond the pedestal. Some of these snow-mushrooms must have weighed a ton.

The interesting question now arises—What happens when more snow falls upon a fully-grown mushroom?

If the strata of successive snowfalls remained horizontal in the eave of a snow-cap, then, as the strain would be greatest at or near where the leverage is greatest, the eave would break off close to the pedestal. Thus where there are many fully grown mushrooms we should, if their structure were of this kind, expect to see in their company the ruins of a considerable number which had received rather more snow than they could support. In point of fact, however, there was scarcely a tree-stump of 2 feet or more diameter near Glacier House of which the snow-cap was in ruin. The absence of ruins, of considerable breakage, and even of untidy fragments, contributed greatly to the beautiful and singular appearance of the mushroom tract.

That the snow-mushroom is, on the whole, so remarkably preserved from sudden ruin by overloading I attribute to bending of the strata under the action of gravity, their inclination to the horizon increasing with the distance from the pedestal. In the numerous photographs which I obtained, the rough edge of the rim (*a*, *a*, Fig. 4) is strikingly contrasted with the smooth dome *b*, *b*. The rough edges show where the pendant strata have broken off by their own weight without ruining the whole structure.

There is also another means by which this structure can get rid of additional snow deposited upon it, viz. by the slipping of the loose surface layer from the highly inclined lower strata near the rim of the mushroom. This slipping may be assisted by lubrication of the harder subjacent stratum when surface snow is melted by the sun. I saw snow melt in the sun during hard frost in February at Glacier House (Figs. 5, 6, 7, and 8).

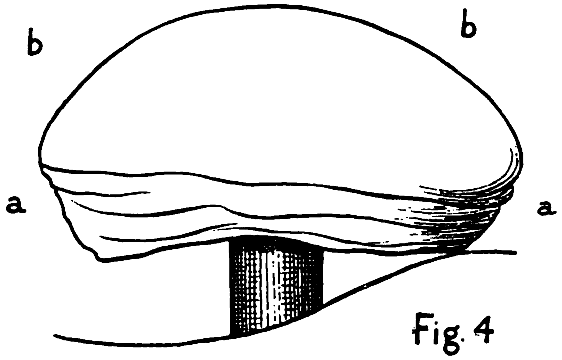

Fig. 4

Snow Mushroom showing rough ends of outcropping strata a, a, and smooth dome b, b, from a photograph.

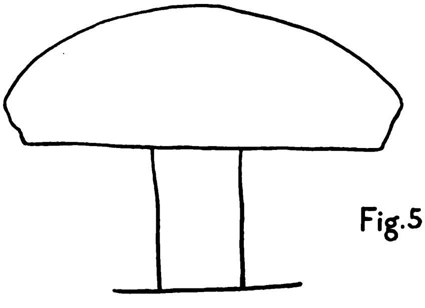

Fig. 5

Snow Mushroom. elevation.

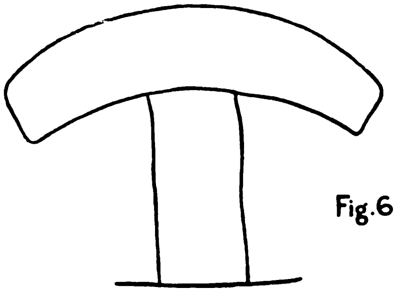

Fig. 6

Snow Mushroom. section.

The perfect representation of a mushroom by the snow-caps on the tree-stumps at Glacier House is largely an accident of proportion between the amount of the snowfall, the diameter of the forest trees, and the height of stump usually left in felling. Where the trees are small, as in those parts of the Rockies through which we passed, the base cannot support a sufficient quantity of snow, and, on the other hand, nearer the

Pacific coast, where the trees are of giant growth (with a diameter often of 14 feet), the snow-cap appears more as a thatch with overhanging eaves.

Above Glacier House Hotel I crossed a mountain stream on the snow-bridge provided by the union of the projecting snow-caps which had formed upon the large boulders. A snow-bridge, being a synclinal structure, has a mechanical advantage over the anticlinal structure of the individual snow-cap, especially in its resistance during slight thaw.

In the forest, however, the bridging over of spaces which occurs with sticky snow renders the surface treacherous. This is more particularly the case among bushes or scrub, where the snow does not pack.

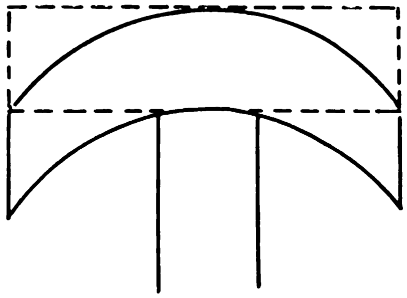

Fig. 7

Snow Mushroom, illustrating bending under gravity.

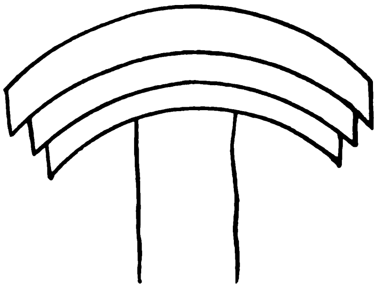

Fig. 8

Snow Mushroom, scheme of supposed stages of growth.

An illustrated article which I wrote for *Pearson's Magazine* (on "Snow-mushrooms," December, 1901) has brought me an interesting letter from Mr. Howard Chapman of Victoria, B.C., from which I extract the following passages:—

"The past two winters the average snowfall in British Columbia has been very slight; at Glacier House it is always pretty heavy. The average fall there for the winter is 48 feet. In the Lardeau it is about the same, but the timber is much larger. . . . I have seen the snow overhanging the stumps in this section for 8 feet all round. There are four districts in British Columbia that I know where you will find this particular growth, and they are all somewhat near. The first is Glacier House; the second between Revelstoke and Arrowhead, on the branch line to Kootenay; the third in the Lardeau; and the fourth between Lardeau and Kaslo, upon the K. and S. railway, at a little place called Whitewater; but in neither place do they grow as large as in the Lardeau. The cause [of the 'mushroom' growth] is the entire absence of wind during the whole winter."

A resident at Glacier House, in transmitting some notes on the snow-mushrooms observed there during 1901–2, says—

"From the first the mushrooms are symmetrical; the stump is round, of course, and as soon as it is covered, the snow, which is soft and tenacious, gradually extends smoothly over the edge. The trunks of the trees do not carry much snow; it generally falls straight down, and loads the branches, but not the trunks."

Before leaving the subject of snow-mushrooms, I may point out that a well-developed specimen (*e.g.* that shown in Fig. 3, Plate I.) has a profile similar to that acquired by the "spreading chesnut tree" and other trees of similar habit, such as oak and beech. The complete form is best seen where, cattle being excluded, the lower branches sweep the ground. As in the case of the snow-mushroom, the form is due to bending under the action of gravity.

NORMAL WAVES OF DRIFTING SNOW.

These are only formed in dry snow.

Previously to visiting Canada I had seen and described (see Appendix) small ripple structures in snow which had their steeper slope facing the wind, the snow being either damp or compacted. I had not, however, seen what I may term *normal* ripples, *i.e.* those which have their steeper face to leeward, as the ripples of loose sand have; neither had I seen snow freely drifting in larger ridges, such as those near Helwan, which I have described and photographed, formed by wind in loose sand,* or those formed by a strong current of water flowing over sand-banks in the estuary of the River Dovey, North Wales, and elsewhere.†

I first saw the normal waves of drifting snow near Montreal on January 5, and I subsequently found that the tendency of cold, dry, falling, or fresh-fallen, snow, to go into such waves is a characteristic and important feature of snowfall and snow-drift in a cold climate.

Fig. 9, Plate I., shows the group of waves met with on January 5 at 10.30 a.m., temperature about 8° below zero Fahrenheit, which were creeping towards the camera with a visible motion. The average wind velocity throughout the day was 30 miles per hour according to the record of McGill College Observatory. The wind was removing from the more exposed places a fresh-fallen layer of three inches of dry snow, drifting it to the shelter of the hedgerows and copsewood. This group of waves was formed on the lee of a swell in the ground, where, at the time, more snow was being deposited than the wind could immediately remove. Four hours afterwards this group of waves had nearly disappeared, probably because the supply of snow-drift was no longer sufficient; but similar waves had made their appearance further to leeward. The average dimensions of the waves, when photographed in the morning, were—

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* "On Sand-dunes bordering the Nile Delta," *Geographical Journal*, January, 1900, fig. 21.

† "On Sand-waves in Tidal Currents," *Geographical Journal*, August, 1901, plate 2.

$$\text{Wave-length} = 15 \text{ feet } 10{\cdot}4 \text{ inches}$$
$$\text{height} = 4{\cdot}9 \text{ inches}$$
$$\therefore \frac{\text{av. length}}{\text{av. height}} = 38{\cdot}86$$

The waves moved 6·52 feet in 40 minutes, which is equal to an *average* rate of 1·96 inches per minute, which, of course, must be less than the speed during gusts, and more than that during lulls.

A later observation at Winnipeg also indicated "inches per minute" as the speed of the snow-waves. On comparing this with a few measurements of Æolian sand-waves of similar dimensions which I made in Egypt, I infer that sand-waves of the same height or of the same wave-length would travel one or two-tenths of an inch, instead of one or two inches, in a minute.

These waves move by depletion from the windward side, and accumulation on the steep lee face. The latter takes place both by snow falling over the crest and by snow swept back towards the cliff from the ground to leeward. As in similar cases with sand-waves, there is a tendency for the first ridge of the group (at the weather end) to be scoured away, and for a new ridge to form beyond the original group to leeward, so that we may have two velocities, that of the individual wave and that of the group of waves. Not all the snow which was drifting here was drifting in the waves, they contained only the surplus which the wind was unable to waft in continuous suspension. A cinematograph picture of these waves would have been interesting; for the slow wave-motion of the ridges contrasted in a curious and instructive manner with the wild whirl of the drift, or current, of snow, and this, of course, does not appear in a stationary photograph.

The waves were not rippled on the surface as the corresponding sand-waves are. The formation of normal ripples in granular snow, and their non-formation in non-granular snow when the latter is falling into waves, confirm my view that the Æolian sand-ripples are caused by the resistances of the individual grains of the surface.*

On January 6 I found waves, formed on the 5th, already reduced to mere stationary ridges of wave-like form, no longer moving before the wind, owing to their surface having "set" hard. There had been no thaw.

On January 10 I saw waves being formed, not as a part of the process of removal, but of that covering the ground with snow. The fall began at 10.30 a.m., and did not cease as long as daylight lasted. It consisted mostly of needles of dry snow one-eighth of an inch long by one-eightieth broad, falling in a moderate breeze at about 14° Fahr. The rate of deposit in the morning was about half an inch per hour. Footprints were refilled to a depth of 1 inch in fifteen minutes, or eight times as fast as the average rate of accumulation. I selected an exposed position, and observed the mode of accumulation of the fresh snow on the icy surface caused by the sharp night's frost which had succeeded to a rapid thaw on January 9.

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* The author "On the Formation of Sand-dunes," *Geographical Journal*, March, 1897.

The fresh snow at eleven o'clock was distributed in patches, which grew in size and number at the expense of the intervening icy ground, but remained irregular in shape and distribution up to 12.30 p.m., when I left. Returning at 2.30 p.m., I found that these irregular patches of snow had become ridges transverse to the not very strong wind, with a cliff on the lee side, with the normal form of waves of drifting powders, and grouped so as to admit of measurement, distances between successive cliffs being 6, 12, 6, 8, and 7 feet. The waves were even visible, in spite of the bad light, in places where the frozen ground was completely covered with fresh snow. A boarded, or " plank," path at the side of a road near by remained still uncovered at 4.15 p.m., and with the actual density of snowfall and strength of wind would never be covered *except by submergence under a travelling wave of snow.*

Later observations on frozen lakes showed that waves thus rolling onward generally leave a thin coating of the lower compressed layers, forming a surface which retains better the falling snow, and thus assists to complete the covering of a smooth or rigid surface.

On January 13 I found the loose snow covering the smooth tracts of ice on the frozen St. Lawrence to be all in waves. The depth of snow covering the level ice was 7·45 inches at the trough, and 11·75 inches at the crest of a wave. Ten successive waves had an average length of 10 feet, and the lateral extension was many times as great as the wave-length. Near the banks of the river the wave-fronts were curved backwards, as is the case with the *current mark* in sandy streams.

During the railway journey from Montreal to Winnipeg, many groups of snow-waves were seen, most of which were on the level ice of lakes, or of wide reaches of rivers, the ice being entirely snow-covered. On our return journey in February, when the bays on the north coast of Lake Superior were frozen, the tendency for the snow to go into waves on smooth ice was also well seen. It appeared that the snow had not come in sufficient quantity to cover all the surface, so that the billows of snow were separated by dark ice. The snow apparently had "set" after deposition, and subsequent wind had reduced the ridges to "basal wrecks" (as a geologist might say), but had left the ground-plan of the waves intact. A satisfactory photograph was obtained of these. This greater prevalence of waves of the drifted material upon an extensive horizontal surface, rigid and smooth, is a striking confirmation of my view that such waves, associated in their origin with the sinuous or wavy flow proper to high speeds,* grow by a tendency to alternate silting and scouring, which, in the case of tidal sand-waves, I have already dealt with,† and which is, perhaps, equally an original condition. In the beginnings of accumulation of snowfall the difference of frictional resistance upon a bed of fresh-fallen snow and upon smooth ice immensely increases the tendency to alternate silting and scouring, for it is evident that wherever a patch of snow succeeds in lodging, the rate of drift is there much slower than, probably only a small fraction of, the rate of drifting upon the smooth ice.

Even when the surface is all covered with fresh snow, an extensive horizontal plain appears to be the best field for the growth of waves, for the liability to local *surcharge* increases with the extent of the field of drifting. Next to the lakes, the flat and open prairie on the north-east of Winnipeg was the best ground which I saw for their development. Where the country is undulating, I frequently saw the waves forming to leeward of a swell in the ground, and, in enclosed country, trains of waves were often formed where much snow had deposited near fences, or outside copses, but, notwithstanding this fact, fixed inequalities or obstacles are, *on the whole*, unfavourable to the development of waves. The more unlevel is the country, and the more numerous the places of shelter, the shorter is the time during which the wind can drift the snow in waves, and the smaller is the extension of the individual groups of waves.

At Winnipeg there were three days which were pre-eminently instructive in the matter of wave-formation. On the morning of January 23, when I had been there a week, and knew where waves were wont to form, I went on to the open prairie in a full gale of wind, in high hopes of a fine demonstration of wave-making. Snow was falling (about 1 to 1½ inches during the day), and the drift hid the lower stories of the houses as I looked back towards the town. Although it was impossible to see far ahead, the detail of the surface at one's feet was clear enough. Not the vestige of a wave was formed during the whole morning. The temperature was about 20° Fahr. when I first went out, and remained high during the morning. The snow came down in fluffy stars one-eighth of an inch diameter, which stuck to every twig of the trees, even in the open, and wooden palings were plastered with snow on the windward side. In a copse, the surface was rippled or mottled in the manner familiar to us in England and Scotland.

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* See Osborne Reynolds, "An Experimental Investigation of the Circumstances which determine whether the Motion of Water shall be Direct or Sinuous," *Phil. Trans.*, clxxiv. pt. iii. pp. 935-982.

† The author, in *Scottish Geographical Magazine*, January, 1901, "On the Formation of Wave-surfaces in Sand;" and *Geographical Journal*, August, 1901, "On Sand-waves in Tidal Currents."

In the open, the snow which collected in depressions had a felt-like consistency, and the excavations eroded by the wind were irregular in shape and jagged in outline, such as might be produced if a felted material were torn by teeth.

On February 17, at Winnipeg, snow fell all day, and I think during a great part of the night, without wind. By the morning of the 18th there was, I estimated, 5 inches of fresh snow which had been evenly deposited. The temperatures on the 18th (in the streets of the city) were, 4 a.m., 5°; 1 p.m., 5°; 3 p.m., 3°; 9 p.m., −3°; 12 p.m., −4° Fahr. As it was blowing pretty strongly, I went out about 9.30 a.m. to the most exposed part of the prairie, and found that the ground was entirely occupied by immense series of snow-waves.

Twenty-nine waves of one series gave the following measurements:—

$$\text{Average wave-length} = 30 \text{ feet } 1 \text{ inch}$$
$$\text{average height} = 7{\cdot}19 \text{ inches}$$
$$\frac{\text{average length}}{\text{average height}} = 50{\cdot}2$$

Average difference between each wave-length and that succeeding = 22·2 per cent. of the average wave-length. This percentage may be termed "the variation" of the group (Figs. 11 and 12).

Another series, practically unbroken, comprised one hundred and ten consecutive waves with an average wave-length of 32 feet 10 inches; this group was measured later in the morning, and "the variation" was greater, viz. 36·55 per cent.

The reason for this deterioration was evident at the time. As the waves rolled on, the lower layers, consolidated by pressure, became exposed, and these could not conform to the shapes and movements of the looser parts, and gradually, in the course of this and the two following days, the appearance of the prairie underwent the complete transformation from that due to forms of accumulation to that of forms of erosion, having their steeper face towards the wind.

It is the readiness with which loose snow is transformed into a compact though friable material, and the rapidity with which a crust forms upon the surface, which prevents the snow-waves from growing to large size. Were it otherwise, the difficulty of winter travelling in cold countries would be much increased.*

When the amount of dry drifting snow is not large, the tendency is not to form series of ridges whose lateral extension is much greater than the wave-length, but to produce deposits the ground-plan of which is of the type shown in Fig. 10, which is intermediate between the transverse ridges and the barchan or medaño shape. In this figure the wind is from the right.

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* Perhaps the caking of dust, when moistened, hinders the formation of dust-dunes in dry climates.

Snow-barchans or snow-medaños were found on the frozen Red River near Winnipeg, and on the frozen St. Lawrence (towards the end of the winter), but were seen in greatest number and perfection from the railway train on the rolling prairie, a little to the west of Moose Jaw. At Boharn I find noted that we had "passed hundreds of 'barchans' in the last quarter of an hour, this being here the normal form;" yet it is not easy to find a good example to photograph. I do not think that they were so perfectly well formed as in sand, which would be due to the more ready "setting" of the snow; and their greater flatness and narrowness increases the difficulty of taking a photograph, especially when one cannot secure an elevated position for the camera.

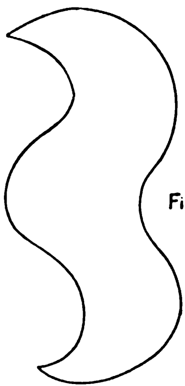

Fig. 10

An intermediate form of Snow wave. ground plan.

Fig. 13 comprises a drawing made from a photograph of a snow-barchan of non-granular snow, and another made from the photograph of a barchan of dry Nile sand, which is Fig. 25 of the paper on "Sand-dunes bordering the Nile Delta" (*Geographical Journal*, January, 1901).

The narrowness of the snow-barchan I attribute to the same cause as the flatness of this and other snow-waves, viz. to the circumstance that the material is able to offer but little resistance to the wind.* The sand-barchan is composed of fine Nile sand. A barchan of coarser sand would probably be bluffer at the bow or windward end.

In this connection I may refer to a fact which came out clearly in my investigation of tidal sand-waves, but was not explained in the paper, viz. that the sand-waves formed by a current of water are steeper (nearly 1 : 12) than those formed by wind (about 1 : 18). Is this greater steepness due to a difference between submerged and dry sand, or is it due to a difference between air and water? I think mainly to the latter, the particular difference which ought to cause greater steepness of the water-formed ridges being the smaller ratio of viscosity to density in the case of water. The result of this should be that if an obstruction cause a vertical sinuosity in the movement of air, the sinuosities to leeward thereof would each be much flatter than the last, whereas in a rapid current of water the rate of

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* The lee slope of the snow-waves at Winnipeg was about 30°, approximately the same as that of loose sand. I suppose, therefore, that the friction between the snow-grains bore the same proportion to that between sand-grains as the density of the snow does to the density of sand. The specific gravity of this snow was 0·38. A determination of apparent specific gravity of sea-shore sand gave 1·6, or say four times that of the snow.

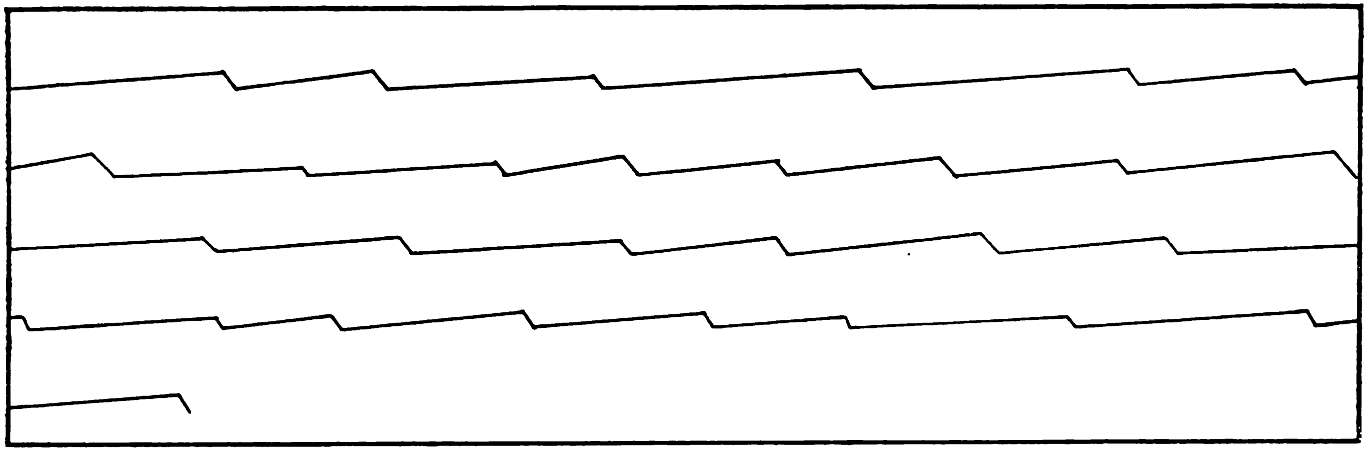

Fig. 11.

Profile of twentynine snow waves, near Winnipeg. Horizontal Scale 1 inch = 32 feet, Vertical Scale 1 inch = 8 feet

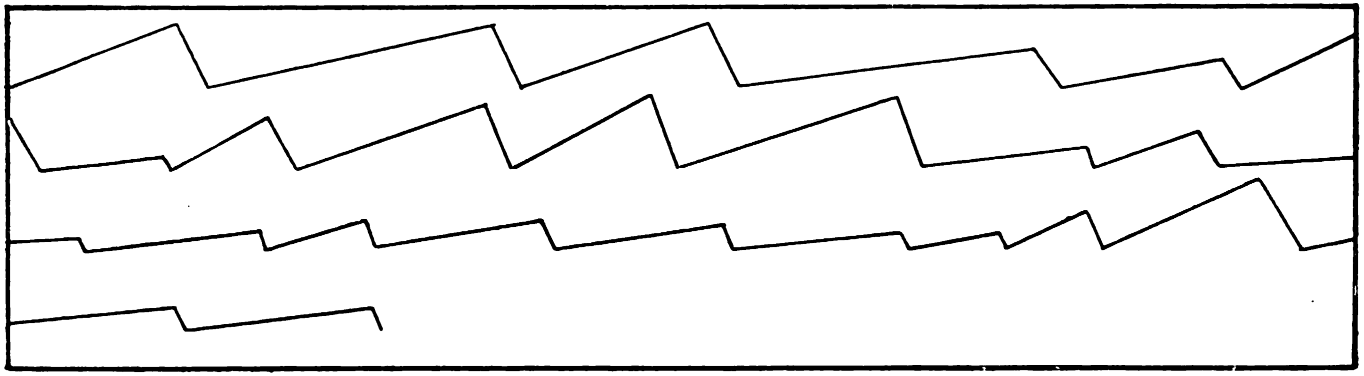

Fig. 12

Profile of twentyfour æolian sand waves near Helwan, Egypt.
Horizontal Scale 1 inch = 32 feet, Vertical Scale 1 inch = 8 feet

flattening out would be much slower. But I think water will roll sand-grains along the bottom when the velocity of the water is below the critical value at which the fluid becomes "wavy." Air, on the other hand, has attained the "wavy" velocity before it will shift ordinary sand at all. What a sand-ridge has to withstand, much depends upon how the stream is directed relatively to the surface. The weathermost ridge deflects the current so as to assist the maintenance of the ridges to leeward, and the more perfectly the fluid can of itself maintain its vertical sinuosities, the less there is for the ridges to resist, and consequently they can grow steeper and thinner before their limit of growth is reached.

The snow-barchans appeared to me to be drawn out, so to speak, as they travelled, the weather slope becoming longer and flatter. This effect I refer to the greater coherence of the snow which had been subjected to pressure, so that the weather slope dragged behind. In the case of any sand which had a distinct tendency to bind or set, one would expect to find a similar effect, and this may perhaps assist to produce longitudinal sand-dunes from barchans.

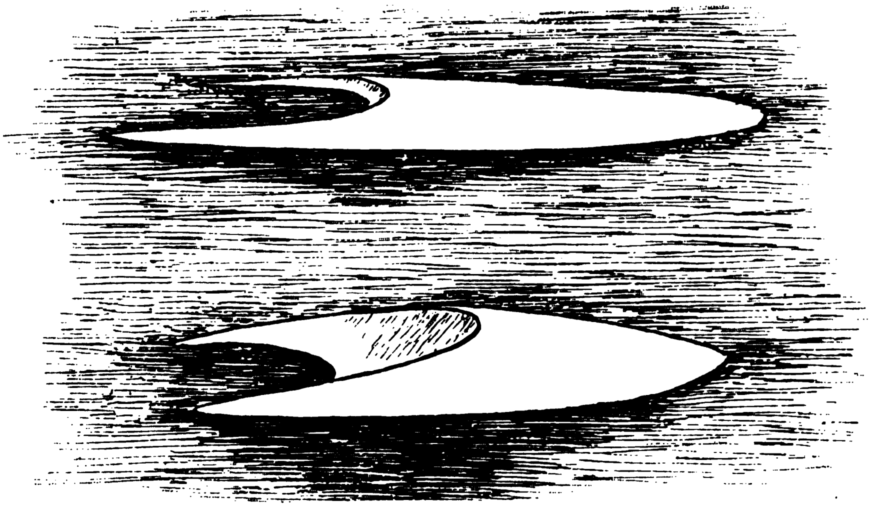

Fig. 13
Barchans of snow and sand, from photographs.

The remaining observations of snow-barchans were on a day when they were curiously evolved from normal ripples in granular snow, and I shall therefore now commence the description of ripples while continuing that of barchans.

NORMAL RIPPLES OF GRANULAR DRIFTING SNOW.

I was not so fortunate as to observe the actual formation of the snow-sand and snow-gravel, although I lingered at Winnipeg on our second visit in the hopes of being present at the process. No doubt one of the most effective means for the production of such snow is the formation of an icy crust by re-freezing after thaw, and the breaking up of this by the under-cutting of the wind. Snow consolidated by pressure also yields lumps which probably rub down into fairly hard granules, and the snow which has drifted in waves sets hard upon the surface during the cold nights, and this crust perhaps yields material for the snow-sand. For the rest, I suppose that a good deal of what has been written about *névé* may be applied to the case of snow which has lain some time upon the prairie.

On January 25, in "zero weather" at Winnipeg, the average velocity of the wind for the twenty-four hours was 26·8 miles per hour, according to the weather report of the St. John's College. The snow had a hard-set surface, due to severe frost (without any previous thaw), and the drift snow at no time rose higher than a few inches from the ground. At 11 a.m., having come across a meat-tin embedded in the compact snow, I removed it, leaving a hole 4 inches deep and 9 inches square. This the drift filled to a depth of 3 inches in nine minutes, or at the rate of 20 inches per hour. During the nine minutes no snow whatever had accumulated in the neighbourhood of the tin, which I had placed upon the surface. In the afternoon the sun came out, and there was a magnificent display of rippling, the best during the whole winter, but the low-drifting snow rendered the photographs unsatisfactory. The drifting snow accumulated in depressions of the rough surface of the old hard snow. These patches of freshly deposited granular drift snow quickly fell into ripples like the Æolian sand-ripples, which increased in wave-length more rapidly than Æolian sand-ripples do.

A ridge of 9 inches wave-length travelled that distance in 110 seconds, *i.e.* at a velocity of 4·9 inches per minute. Æolian sand-ripples of the same wave-length in a wind of similar strength, observed on the sandhills, Poole Haven, Dorset, February 4, 1896, travelled 12·25 inches in twenty minutes, *i.e.* with a velocity of 0·61 inch per minute, and others with a wave-length of 4 inches, situated in a more sheltered position close by, travelled at the rate of 0·41 inch per minute.

Thus it appears probable that a wind produces about the same rate of advance in both ripples and waves of a powder, and that this rate is greater for dry snow than for sand. More measurements of these rates would be valuable.

For a time all the ripples in a patch of the drift snow grew at the same rate, thus preserving approximate equality among themselves;

but presently a new thing occurred, namely, the ridge furthest to windward began rapidly to outgrow the others. I suppose this happened when the patch of drift snow had risen as high as, or higher than, its surroundings. A deflection of the wind due to the growth of the weathermost ridge was soon observed, and some of the drift snow in the centre of the patch began to travel backwards against the wind. This effect was speedily followed by failure of the ripples, which became indistinct, and, after a time, vanished altogether, except that, in some cases at any rate, there was a little rippling left at the tips of the two horns of the now sickle-shaped or barchan drift. In *one* instance it happened that, instead of the middle line being swept bare, a tongue of snow formed there, producing the form shown in Fig. 17, which is found also in deserts* (Figs. 14, 15, 16, and 17).

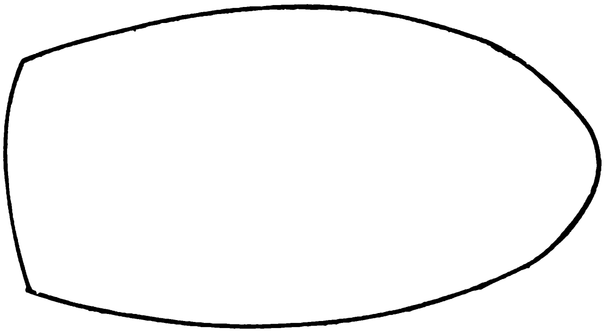

Fig. 14

A patch of rippled snow, plan wind from the right hand.

Transversely, the surface of the patch of drifted snow was level when in the rippled stage, but afterwards the weathermost ridge grew most rapidly in the middle.

The longitudinal profile undergoes yet further transformations. At first the section through the centre has a steep weather face and a long gently inclined lee face; but the slope of the weather face continually decreases, and that of the lee face increases, so that the crest travels, so to speak, through the wave.

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* A. v. Middendorf, quoted by J. Walther, 'Die Denudation in der Wüste,' p. 167, "Eine zweite Form unterscheidet sich von der vorigen (the Barchan) nur dadurch, dass mitten zwischen den beiden Zungen sich eine kürzere und schroff abfallende dritte Zunge gebildet hat, die nahezu die Mittelrichtung zwischen den beiden anderen einhält."

Fig. 18, Plate II., shows a patch of rippling photographed in still weather. The ratio length ÷ height is 28·44, *i.e.* they are much flatter than Æolian sand-ripples, but steeper than the trains of snow-waves which I have measured. The latter, however, were composed of snow either not granular or much less granular than the ripples, and therefore probably lighter. The snow-granules in these ripples averaged

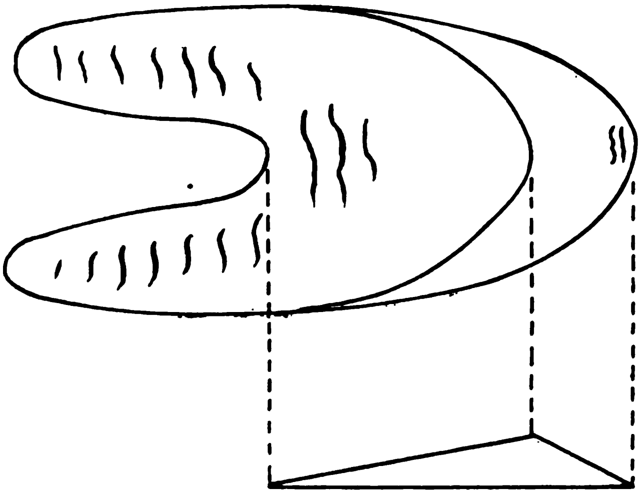

Fig. 15

Conversion of above to a Barchan, early stage.

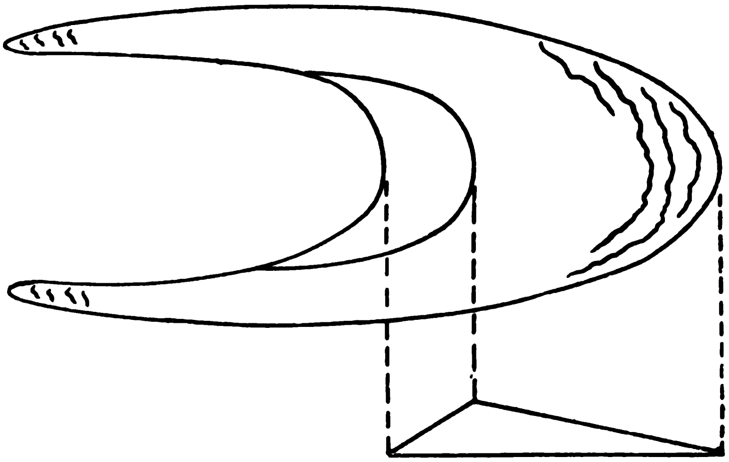

Fig. 16

The same at a later stage

$\frac{1}{32}$ inch in diameter, corresponding to "coarse sand." * I have seen snow of approximately granular character, but in particles $\frac{1}{64}$ inch diameter, refuse to ripple under prolonged wind-action. Snow-granules of $\frac{1}{12}$ inch to $\frac{1}{9}$ inch form well-marked patches of rippling in which the wave-fronts are not so long and straight as with the $\frac{1}{32}$-inch granules, but have a steeper windward slope. The grains of the surface layer are sometimes as much as $\frac{1}{7}$ inch average diameter. This is the size of small "gravel."

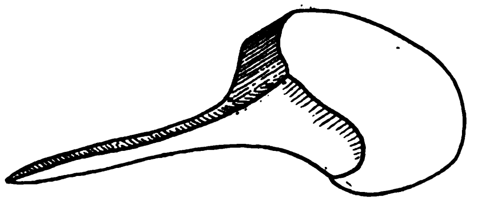

Fig. 17

Longitudinal growth on lee side of a travelling snow-drift.

The following are the detailed measurements (in inches) of the group of ripples shown in the photograph :—

No.	Length.	Height.	$\frac{\text{Length}}{\text{Height}}$
1	2·625	0·09375	28·00
2	2·625	0·09375	28·00
3	2·562	0·09375	27·33
4	2·344	0·09375	25·00
5	2·062	0·0625	33·00
6	2·000	0·0625	32·00

$$\frac{\text{Total length}}{\text{Total height}} = 28{\cdot}44$$

variation of wave-length = 4·43 per cent.

ON THE "SETTING" AND PACKING OF SNOW.

It has been mentioned above that the snow often sets hard upon the surface during the night when there had been no previous melting, and that this property hindered the growth of large waves. Thus snow-waves formed on January 25 at Winnipeg, on the frozen river, had on the 28th a surface so hard that it was scarcely dented by the heel of the moccasin. (The highest temperature during the week ending January 29 was 24° Fahr., and the lowest −28° Fahr., according to the weather report of St. John's College, and there was no apparent melting in the sun.) This resistance was due to a layer one-eighth of an inch thick, all below being comparatively soft. Pieces of the crust, when broken off and held up to the sunlight, were seen to be a mosaic of small translucent icy blocks cemented firmly by opaque ice.

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* 'Mechanical Composition of Wind Deposits.' T. A. Udden. 1891.

During nights which are cold, still, and clear, and in situations where the surface of the snow can radiate freely, I suppose that there is in the surface layers a considerable condensation of solid matter from aqueous vapour evaporating in the dry way from the lower layers of snow, under the action of the Earth's escaping heat.

On January 28, temperature 10° Fahr., snow from the upper 2 inches of some of these waves was weighed, and found to have a specific gravity of 0·38. At the same time, in a copse near by, the snow, which moreover had no crust on the surface, had a specific gravity of 0·19. This is about twice as heavy as new-fallen snow, but only half as heavy as the snow which had been chased about by the wind.

People say that the snow "dwindles away" on the prairies, and the above measurements may help to explain this. If the samples taken be truly representative, they indicate that after an interval, when 8 inches of measured snowfall would be represented in a wooded country by a 4-inch layer, there would be only a 2-inch layer on the prairie. Densities of snow were also taken at Glacier House on February 16. At the surface the specific gravity was 0·106, at the depth of 1 foot 0·195, and 4 feet 0·354. The second value is that of the surface snow in the woods at Winnipeg. It requires the pressure of more than 3 additional feet of snow to pack the material as tightly as the wind did on the prairie. The wind, by turning the material over and over, facilitates the escape of air. The pressure of superincumbent snow, on the other hand, helps the enclosed air to prevent the solid parts from coming together.

In zero weather I often found that lumps of snow were at the same time hard and light, and when thrown down upon other lumps, the noise resembled that which is made by throwing a piece of coke upon a heap of the same material. I surmise that when snow sets hard without packing, or re-freezing of films of water, the result is due to sublimation; that is to say, evaporation in the dry way and subsequent condensation from vaporous to solid form. I think it is reasonable to suppose that when sublimation goes on within a porous body, there will be excess of evaporation from the walls of the larger cavities and an excess of condensation upon the walls of the smaller cavities so that surfaces nearly in contact will be cemented together. By such means the body would become stronger and more rigid without increase of density.

SCARPED WAVE-SURFACES, AND LONGITUDINAL EROSION FORMS IN CONSOLIDATED SNOW.

We have seen how wind, in removing loose, dry snow, drifts it into normal waves. When the material is either too sticky or too compact it will not behave thus, but even then the wind does not remove the snow

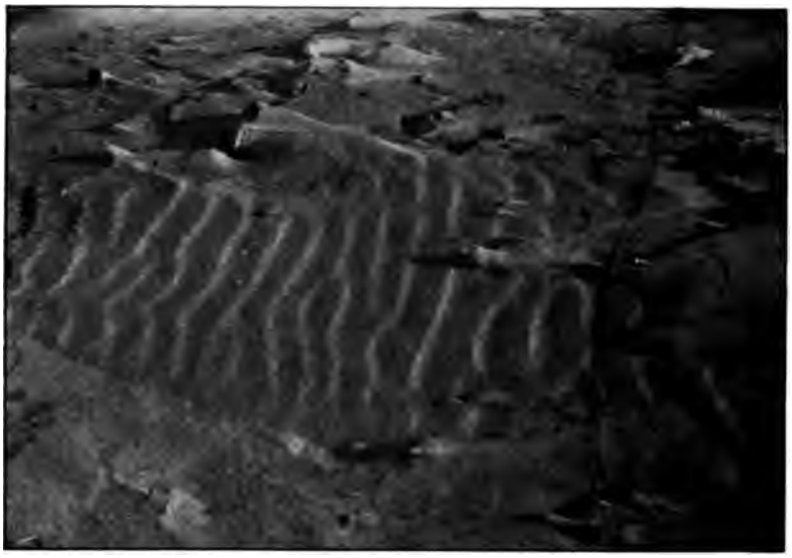

Fig. 18.

NORMAL RIPPLES IN GRANULAR SNOW.

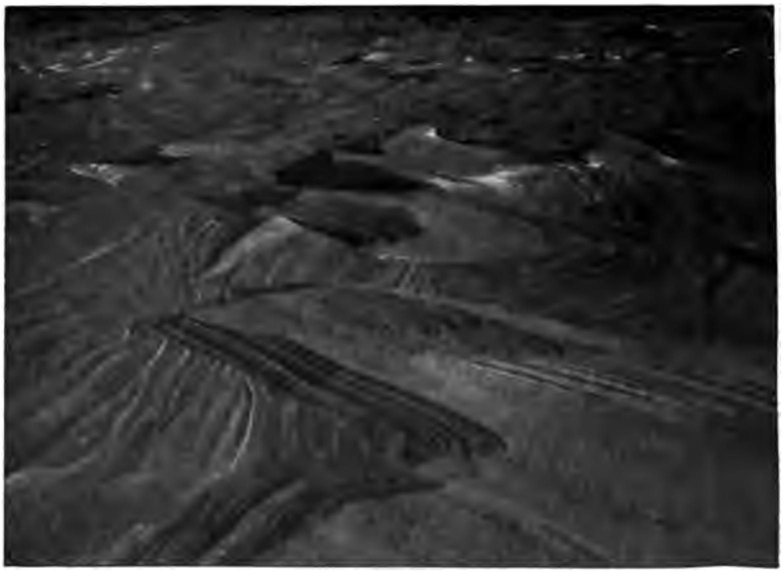

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Fig. 19.

STRATIFICATION OF SNOW REVEALED BY WIND EROSION.

in uniform layers. On the contrary, any small shallow depression tends to multiply itself to leeward, owing to the deflection of the wind, which leaves the snow in shelter for some distance, and then, descending, scoops out a second depression, and afterwards a third, and so on. The series of vertical sinuosities thus formed sometimes acquire considerable lateral development, especially when they are only cut in the top layers of snow. The ridges thus formed are of two orders, corresponding to ripples and waves. The former are generally due either to falling flakes of moist snow (see Appendix) or to the stratification of the snow, which is beautifully revealed by wind-erosion. The figures and photographs (Fig. 19, Plate II., and Fig. 20) illustrate the relation of the stratification grooves or ripplings to the larger ridges.

The latter when fully developed attain a ratio of depth to length, which is much greater than that of the normal waves and ripples of the less resistant drifting snow.

The following are examples, viz. :—

Six ridges had an average wave-length of 13·75 inches, with an average irregularity of 21·45 per cent. The ratio length : height was 20. The snow was stratified. In another case of stratified snow the dimensions of one ridge were taken across seven sections, giving an average wave-length of 12·95 inches, and a ratio of length : height 15·62.

Four ridges of unstratified snow had an average wave-length of 23·7 inches, and the ratio length : height was 19·2. These were in snow on the smooth ice of the Assiniboine river. There was 1·75 inch of snow at the troughs.

In the following series of excavated ridges the (horizontal) length of the weather-facing and lee-facing slopes were separately measured (in inches) :—

Weather slope.	Lee slope.	Wave-length.	Height.	$\frac{\text{Length}}{\text{Height}}$
11	18·75	29·750	1·875	15·87
10	11·625	21·625	1·750	12·36
11·25	20·875	32·125	1·750	18·36
15·375	14·125	29·500	1·375	21·45
15	16·625	31·625	1·250	25·30

$$\frac{\text{Total length}}{\text{Total height}} = 18{\cdot}08.$$

variation of wave-lengths = 16·17 per cent.

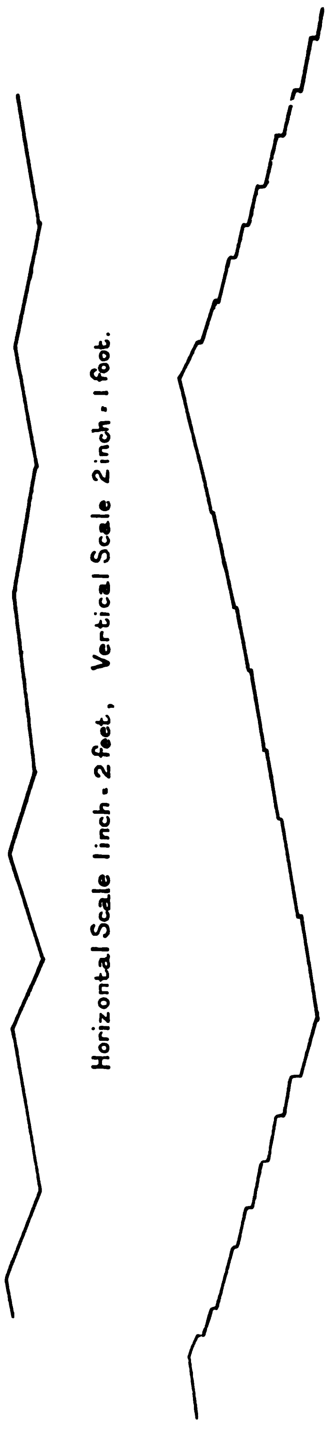
This is the series shown in Fig. 20.

As the erosion progresses and the top layers of snow are removed, the snow-rock becomes harder, and the detritus adheres less to its surface and abrades more vigorously. Thus notches in the ridges, instead of being mended by the detritus, are increased by it, so that the transverse ridges are presently cut through, and we pass by stages from an arrangement of ridges transverse to the wind to that of longitudinal structures having their greatest extension parallel to the wind.

I suggest that some *longitudinal sand-dunes* are produced by a similar course of events.

Between the two extreme cases are various transition stages, in which sometimes it is the form of the depression instead of that of the salient parts which dominates the eye. Sometimes these depressions are pits shaped like the fuljes described by me in the *Geographical Journal*, March, 1897, January, 1900, and August, 1901, but turned the other way round, *i.e.* the steeper slope is exposed to, instead of being turned from, the wind. When the wind has cut right through along the line of the original notches or re-entrants, the residual hillocks sometimes have a form which is related to, though not identical with, that of a barchan (Fig. 21).

To watch the windborn detritus cutting away the snow-rock on



Horizontal Scale 1 inch = 2 feet, Vertical Scale 2 inch = 1 foot.

Part of the same, enlarged, showing stratification.

Fig. 20

Profile of undulating surface produced by wind in compact snow.

the frozen prairie is an education in the processes of Æolian erosion and denudation. Knowledge can be thus obtained not only more quickly than with harder rocks, but in some respects more completely, for it is easier to discriminate between the transition forms and those which are more stable.

Ripplings, which Heim calls *Schmeltzwellen*, are also produced when snow melts under the influence of a warm wind.

I measured a group of eight of these, which averaged 3·3 inches in wave-length, with a variation of 17·9 per cent.

The best exhibition which I saw was on February 14, when a *chinook* wind with a temperature of 42° Fahr. sprang up whilst I was out on the prairie at Moose Jaw, Assiniboia.

The relations of the waved surface formed by erosion of sticky or of compacted snow to normal snow-waves may be further explained as follows :—

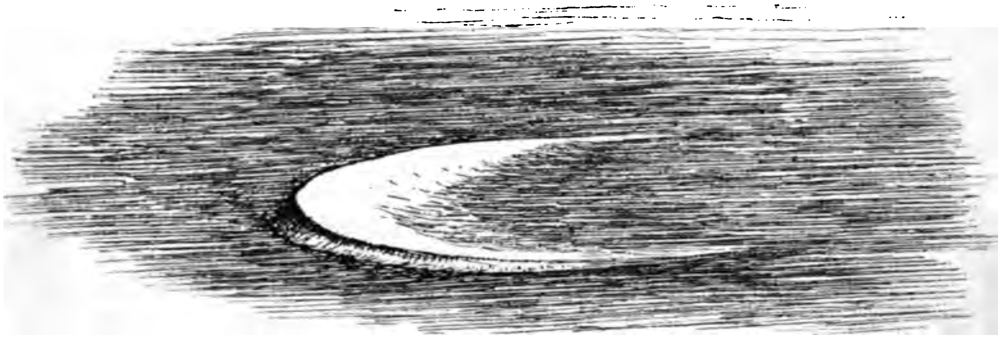


Fig. 21

Erosion form analagous to a Barchan, wind from the left, from a photograph.

As long as snow-flakes or granules adhere very little, wind not only shapes the surface into the form of waves, but makes the whole aggregate roll forward, so that the particles of the moving waves themselves move in a periodic manner, and the internal structure of the travelling waves, *i.e.* the arrangement of the particles of which they are composed, is due to the periodic movements of the material. When, however, the snow becomes conglomerate instead of loosely aggregate, so that the particles can only be removed in fragments—for they break sooner than part company with the neighbours to which they are attached—the course of affairs is different. Then, although the wind sometimes carves the surface into the form of waves, and although these forms move, yet the subjacent material does not move, and its structure is not wavy. Such scarped wave-surfaces might be called *kymatoids* or *kumatoids*.

It is common to see both scarped wave-surfaces and normal waves simultaneously, so that there are small cliffs of snow facing in opposite directions, one set reflecting the sun, and the other in shadow. At first the appearance of the snow-covered prairie when in this state seems hopelessly complicated, but it is not really so. When the mind has mastered the two sets of forms produced by wind in snow (or other powder), in the incoherent and coherent condition respectively, the eye soon detects an order among the inequalities of surface.

ON THE SNOW-DRIFTS CAUSED BY INEQUALITIES OF THE GROUND, OR OTHER FIXED OBSTRUCTIONS.

Under this heading are treated the inequalities of snow-surface due to the action of fixed obstructions upon the wind.

Snow-fences of the form shown in Figs. 22 and 23 are commonly erected in Canada to check the rate of snow-drifting. After the first snowfall a snow bank or drift is produced, having a moderately gentle slope to windward and a cliff or talus on the lee side. The form resembles that of a sand-dune or any other wave of a drifted powder, which at first suggests that the form proper to a drift caused by the fence is similar to that of freely drifting snow. This, however, is not the case, for the structure is as yet incomplete, owing to insufficient supply of the material. Succeeding snowfalls build out the drift in the manner shown by the successive positions of the lee face in Fig. 24, until we have at last, perhaps not until nearly the end of winter, the completed form in which there is no lee cliff, but a long, gently tapering slope on the lee side, the weather face retaining its original form and *relatively* steep slope.

When we have to do with large bluffs or cliffs, the whole of the winter's snow is not sufficient to fill in the area of eddies on the sheltered side so as to reduce the surface to "easy lines." Thus the largest drifts are never of completed form, but have always a steep face to leeward. Completed drifts, having no shadow-throwing cliffs, are also much less conspicuous relatively to their size. Thus circumstances combine to prevent the casual observer from discovering what is the profile really proper to a snow-drift.

Fig. 25 is drawn from a photograph of a snow-drift near Winnipeg, where one side was complete and the other incomplete. The consolidation of the snow between snowstorms accounts for drifts being formed on both sides of the railings.

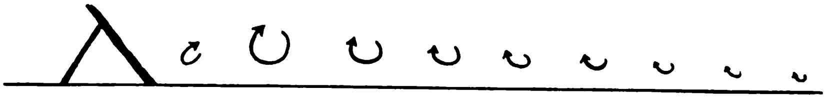


Fig. 22
Fence and system of Eddies.

The great length of the lee-slope in proportion to the height of a drift explains at once how obstructions tend, on the whole, to produce longitudinal drifts in place of the transverse ridges which arise where snow drifts freely in sufficient quantity. It is evident that unless the breadth of the obstacle be many times greater than its height, the principal extension of the completed drift must be longitudinal, not transverse. This should be noted by those who may still cherish the notion that the waves in sand or snow are usually produced by obstructions.

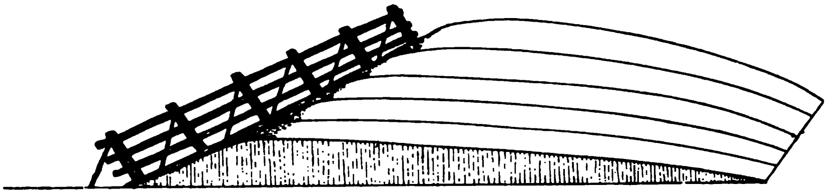


Fig. 23
Fence and completed snow drift.

The ground plan of the principal snow-drift caused by a house on the prairie near Winnipeg is that of an elongated horseshoe. Not only is the ground swept clear by the wind near the corners of the building, but there is a long stretch to leeward between the two arms, or horns, of the drift which is kept clear, or nearly clear, of snow, and which, I think, sometimes extends further than the drift can be traced. It is easy to recognize the relation of the form of these fixed banks to that of the barchan or medaño of freely drifting snow (Figs. 26, 27, 28, 29, 30, and 31).

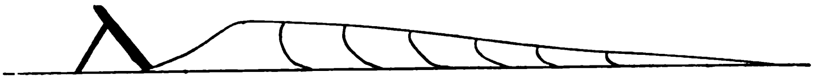


Fig. 24
Fence and snow drift showing stages of its growth.

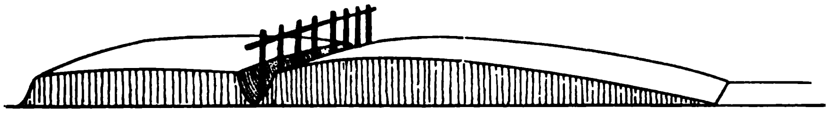
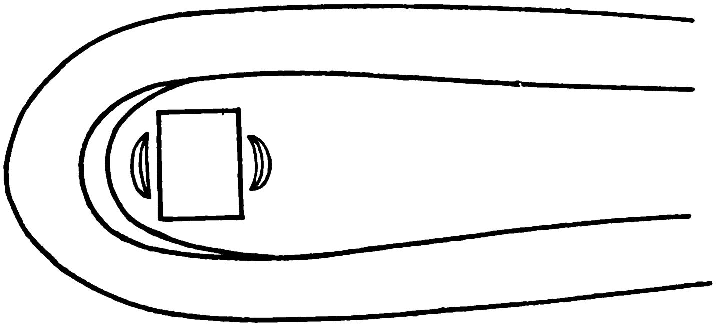


Fig 25
Snow drift on both sides of a fence. on the right completed. on the left incomplete. from a photograph.

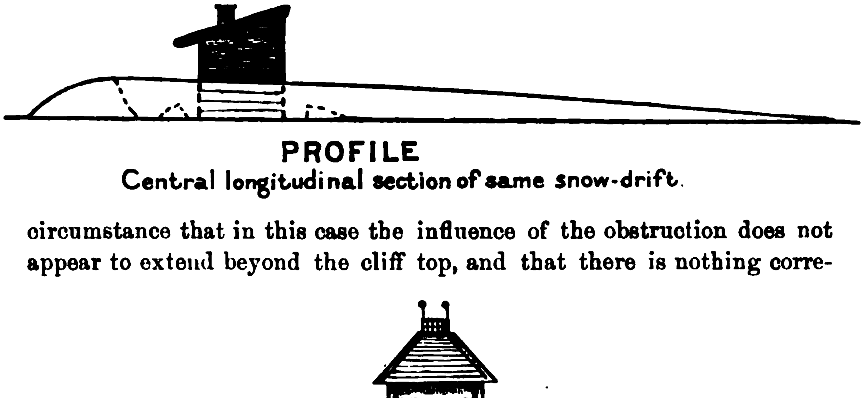
The form of the excavation round trees, observed very frequently in woods near Montreal, calls for remark (Figs. 32, 33, 34, and 35). Here the snow lay deeper and drifted less than near Winnipeg. As the drifts above described are analogous to barchans or medaños, so these hollows are analogous to fuljes. What requires explanation is the circumstance that in this case the influence of the obstruction does not appear to extend beyond the cliff top, and that there is nothing corresponding to the outer, windward slope of the prairie drifts. I think this is due to the circumstance that air in flowing over a thick bed of

Fig 26



PLAN
of the principal snow drift around a house on the prairie, near Winnipeg, wind from the left.

Fig. 27



PROFILE
Central longitudinal section of same snow-drift.

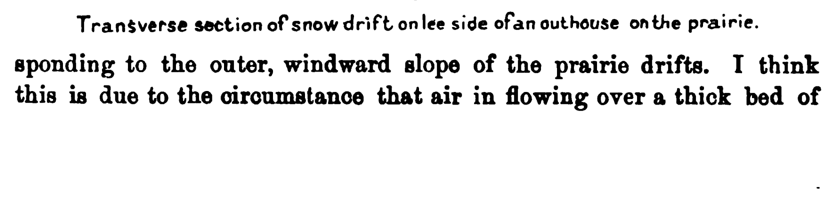


Fig. 28

Transverse section of snow drift on lee side of an outhouse on the prairie.

loose, soft snow is not thereby thrown into such strong upward whirls as in flowing over a rough and rigid surface.*

Under circumstances when larger trees have a space round them clear of snow, saplings have none, even though they be large enough to be practically rigid. This is presumably because the smaller obstacle does not cause so strong a vortex.

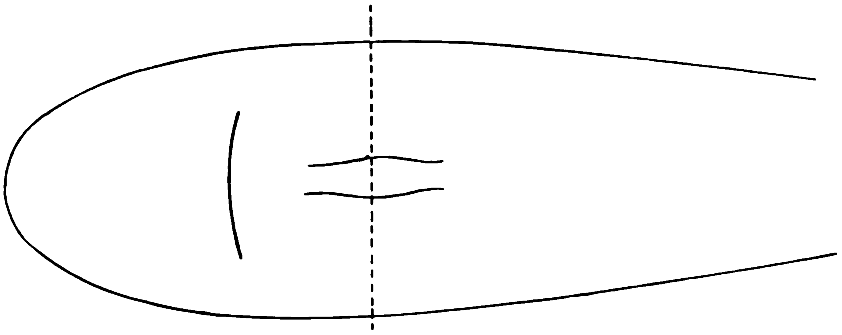


Fig. 29
Plan of snow drift caused by clump of bushes, wind from the left.

On both sides of a wooden wall the snow ultimately banks up, so as to leave only 2 or 3 inches clear at the top. At the ends of the wall the ground is swept clear of snow, except in the event of a fall of sticky snow plugging the holes and subsequently "setting." The excavations at the ends, if brought together, reproduce the hollow which is seen round trees and such narrow obstructions. In the centre of the bank

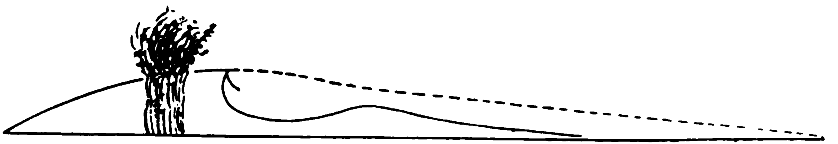


Fig. 30
Profile (dotted) and central longitudinal section of the same drift

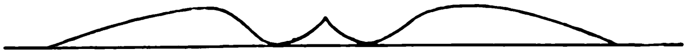


Fig. 31
Section across the dotted line of Fig 29.

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* Determinations on six days gave 2·2 miles per hour as the rate of subsidence of snowflakes. Where the slope of the ground gives an upward velocity of about this amount to the air, the snowflakes are presumably maintained in eddying suspension. Thus the slow rate of subsidence explains the marked effect upon the depth of the snow-deposit, which is exercised even by gentle undulations in the ground, which have such "easy lines" that they cannot give rise to strong eddies.

on the windward side of the obstruction in the latter case is an inflexion of the curve in plan, shown in Fig. 36, at the spot where there is presumably no lateral current of air.

On widening out the obstruction, this central projection becomes the bank on the windward side of the wall. Here the wind eddies round and round in a repeating circle, so that, I suppose, gravity has time to exert its effect and brings the snow down. The clearance near the ends of the wall is where the path of the air, as I suppose, is something like an open spiral, in which the drifting snow follows a continuous, not a re-entrant, course. The spiral is right-handed at one end of the wall, and left-handed at the other.

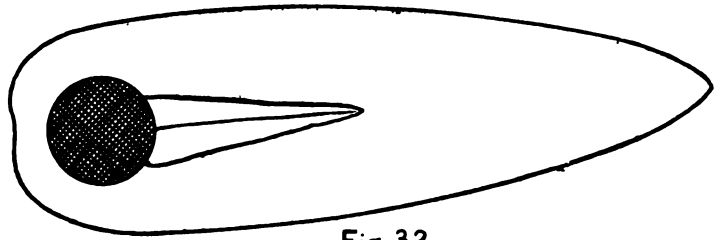

Fig. 32
Plan of hollow round a tree, wind from the left.

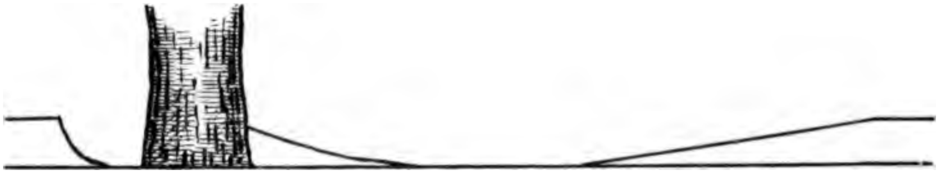

Fig. 33
Longitudinal section of the same.

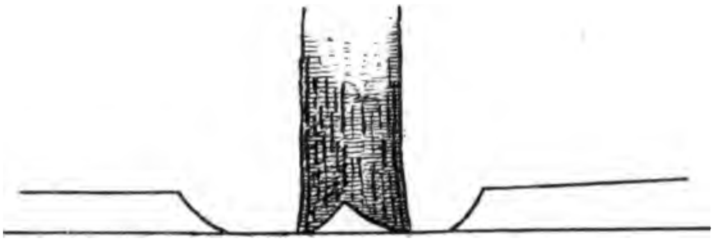

Fig. 34
Cross section of the same. lee side.

Under this heading I must refer to the behaviour of the drifting snow with relation to the whole city of Winnipeg, considered as one obstruction upon the level surface of the prairie. When the wind was strong, the sky free from ordinary cloud, and the temperature at or below zero Fahrenheit, the air in the streets usually remained clear and almost free from snow, although the sun was dimmed by something like a dust-cloud, and halos and parhelia indicated the presence of icy particles in the air.* As one approached the limits of the city, however, and looked out upon the open prairie, one saw a very different state of things. The snow was drifting so thickly near the ground that nothing could be distinguished through it, and only the upper parts of houses on the prairie stood out fairly clearly from the whirling white haze, which produced an effect not unlike that of spoon-drift in a storm at sea. How, then, are we to explain the clearness of the air in the streets?

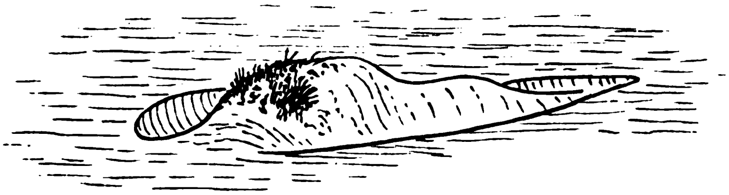

Fig. 35
Hollow cut by wind, from left, around a heap of manure on a field, from a photograph.

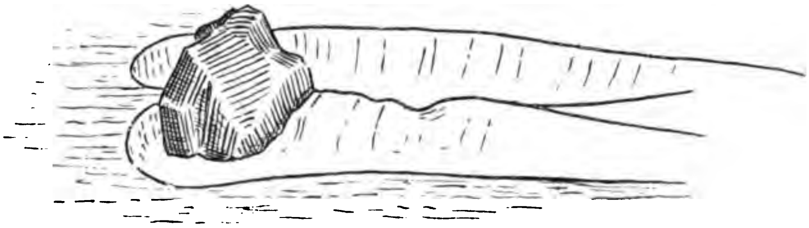

Fig. 36
Hollow etc cut by wind, from left, around a stone from a photograph taken in Scotland February 1900.

Either the drifting snow got past the city, or it did not. If not, there must have been enormous snow-banks produced on the windward side, whereas the drifts there were not really of great size; on the other hand, there was much snow on the more sheltered side of the city, in the woods, etc. It appears, therefore, that great part of the drifting snow got past the city, so that the question which remains to be answered is—Did it go round, or was it wafted over? Winnipeg is an exceptionally widespread city of about fifty thousand inhabitants, so that the height of the houses is very small in comparison with the width of the town. Having examined the snow-drifts in the suburbs, and noted their absence from the streets, I came to the conclusion that a great part of the drifting snow was wafted quite over the city.

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* See Appendix, "Sun Pillars."

ON THE RELATION BETWEEN SURFACE WAVES IN WATER AND IN POWDERS.*

At sea the water is always rising in front of the crest of each advancing wave, and sinking behind it. When the wind blows over these ridges it goes into eddies on the lee side, and the pressure is less there than on the weather slope of the wave. This difference of *pressures* maintains and increases the height of the wave. The liquid flows under the action of gravity from places of more to places of less atmospheric pressure, and this is by far the greater part of the mechanism by which wind maintains and increases the waves of the sea. The process is abetted by the readiness with which wind adopts a sinuous form of flow. There is also an auxiliary, but, in the case of water-waves, distinctly subordinate, process in the wave-making due to the friction of the wind upon the surface of the water (capillarity may be neglected in the case of the larger waves which we are considering). This friction tends to drive the water-particles near the surface towards the crest of the wave, pushing them forward on the weather slope, and dragging them backward in the eddy on the lee side.

In the maintenance and increase of the corresponding waves in powders, we have first, as in the case of liquids, the predisposing condition in the tendency of the wind, upon very slight provocation, to adopt the sinuous flow. There is also the same distribution of eddies, with difference of pressure on the two sides of each ridge, and the flow of the bottom layer of air towards the ridge from both sides, with an accompanying prehensile action upon the surface. The relative importance of these two factors of wave-making is, however, reversed. A powder does not undulate as a liquid by the transmission of gravitational pressure It does flow under the action of gravity to a limited extent, viz. until its slopes are reduced to the angle of repose characteristic of the material, which for dry sand is about 30°. On the other hand, a brushing of the surface much more readily separates the surface particles of a loose powder than those of a liquid from their subjacent neighbours, so that the frictional transport from both sides towards the ridges is much greater in the case of a powder than in that of a liquid. Consequently, the filling of the eddy spaces on the lee of the ridges is brought about differently in the case of the travelling waves of water and of powders respectively. In a powder the material which collects against the lee face of the ridge, causing it to advance, is gathered from the surface layers—that is, from no appreciable depth; but the horizontal distance from which the particles are brought to the shelter of the ridge is a whole wave-length. In deep-sea waves, on the other hand, the excursion of the particles which fill up the eddy space and produce the advance of the ridge is small. In steep waves the particles which travel furthest only move about one-eighteenth wave-length horizontally, but the depth to which the movement appreciably extends is a large fraction, say one-half of the wave-length. The amount of motion of water due to pressure, and tending to equalize differences of pressure, is so much greater than the amount due to dragging towards the crest by friction, that sea-waves are, in the deep, of not very different steepness on the weather and the lee side respectively. In the case of powders which cannot so adjust themselves to atmospheric pressure, the waves soon acquire, and thereafter maintain, a great difference of slope on the two faces.

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* I employ this word to indicate the condition of the body without reference to its mode of production. (This paper was written before the reading—February 13, 1902—of Prof. Osborne Reynolds' paper "On the Sub-mechanics of the Universe" (*Abstract Proc. Roy. Soc.*, vol. lxix. No. 457, March 21, 1902), otherwise I might perhaps have used the term "granular medium" instead of "powder.")

ON THE "ICHTHYOMORPHIC" CHARACTER OF STATIONARY SNOW-DRIFTS AND THEIR RELATION TO TRAVELLING SNOW-DRIFTS.

The study of sand-drifting and snow-drifting largely consists in observing the form and position of eddy spaces, and the manner in which they are filled by the transport and deposition of the particles which the current of air or water removes from the surface of the powder. From an examination of the snow-drifts in Canada, I came to the conclusion that a curve of the character shown in Fig. 37,* with the blunt end towards the wind, was the fundamental element of their form.

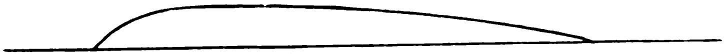

Fig. 37
The fundamental curve of snow drifts.

This, which I may term the *ichthyoid curve*, is the profile of *completed* drifts in the neighbourhood of obstructions on the prairie.

Inverted, it is the profile of the holes round trees, as observed in the woods near Montreal.

Viewed in plan, it is the curve cut out in the snow round the end of a wall.

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* These curves are, for convenience, drawn with the vertical dimension exaggerated.

Viewed in plan together with its image, it is a boundary curve enclosing the horseshoe-shaped banks round houses near Winnipeg, and equally the hollows round trees or stones.

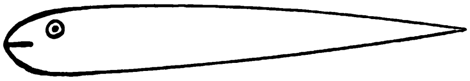

Fig. 38
The same doubled.

This doubled curve has the generalized form of a fish * (Fig. 38), or if it be spun round so as to give the outline of a solid body, we have the modern Whitehead torpedo with the blunter head now preferred to the older sharp-nosed form.

The analogy to the fish-form is still more striking if we look at fishes from above instead of viewing them in profile.

The doubled curve is, again, that of the fore-and-aft section of the propeller-shaft struts, or "A frame," as approved by the Admiralty. These projections from the ship have to be constructed so as to give as little resistance as possible. Being wholly submerged, the most important point is that they should have a form which shall cause as little eddying as possible. Prof. Hele Shaw, F.R.S., has shown that if they be turned round so that the sharper end becomes the fore part, the eddy-making is considerably increased.† I had not this or other kindred facts before me when I worked out the generalized curve for snow-drifts, and was quite unbiassed by such considerations in my selection.

When the snow is drifting, one can see that it whirls in the largest circle not far from the obstruction, that there is whirling motion for a long distance to leeward and for a relatively short distance to windward. I regard the completed snow-drift in the neighbourhood of an obstruction as a filling in of the eddy-space in such a way as to provide easy lines for the flow of the wind.

I suggest that the forms of such drifts are worthy of study as an index of forms of least eddying resistance. They suffer, it is true, from the disadvantage of being situated on the floor over which the current flows, and so far are less valuable in this regard than the forms of fish, cetaceans, birds, and flying insects. On the other hand, the animated forms have to fulfil other functions besides those of progression, and are possibly a compromise.

It will not have escaped the notice of the reader that in waves into which freely drifting powders fall, the steep side is on the leeward instead of upon the windward, and that this signifies that the eddy-space is *never* filled up. The whole eddy-space is, in fact, free to move forward, and does so when the snow is drifting, and this progression is the wave motion.

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* The profile of the snow-drift resembles the profile of a sole or other flat fish.

† *Vide* "Experiments on Surface Resistance of Water," *Engineering*, vol. lxv April 22, 1898. Figs. 39 and 40 of that paper confirm the dictum of the late Mr. William Froude that "it is blunt tails rather than blunt noses that cause eddies." See also *Movement* by E. J. Marey (trans. E. Pritchard), 1895, p 97.

The relation between the profile of the snow-drift and that of the waves of drifting snow and sand may be further illustrated by drawing the profile of the wave, not in the usual way, from trough to trough (Fig. 39), but from crest to crest (Fig. 40). We then see that the unfilled space between the two ridges has the blunt nose and fine tail profile; that it is the profile of the hollows in snow round trees and of the fuljes of sandy deserts, the form proper to an eddy space.

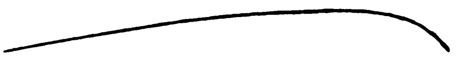


Fig 39
Snow wave from trough to trough

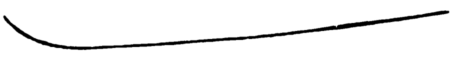


Fig. 40
The same from crest to crest

I repeat that the powder, when drifting in waves, has the "fine nose and blunt tail form," which is that of greater eddy-making resistance (the nose being that part turned towards the wind), and that the powder, when in its complete accumulation near fixed obstructions, assumes the "blunt nose and fine tail" form, which is that of less eddy-making resistance. Both forms are simultaneously produced on a snow-field, and both are compatible with the removal by the wind of the maximum quantity of snow in the course of the winter. Thus, on the one hand, the maintenance of strong eddies in the drifting waves evidently increases the power of the wind to drive the snow before it; and the hindrance offered by a fixed obstruction is best minimized by filling in its eddy-space with a structure which shall thereafter absorb as little energy from the wind as possible.

Sometimes, as we have seen, the freely drifting snow is accumulated in isolated hillocks, which I have called barchans or medaños. Sometimes their development from patches of drift snow can be observed. These patches have in ground plan a fine nose towards the wind, and a blunt tail or lee end—a sort of delta shape, but with curved sides (Fig. 14). I have seen the same thing in sand. This is in accordance with the habit of the freely drifting snow to adopt a fine nose and blunt tail arrangement in vertical profile.

Freely moving barchans of less or greater elongation probably fill in less or more of the narrow end of the ichthyoid curve. The crest of the cliff will be lower than the summit of the barchan if the former be beyond the broadest part of the curve.

As the easy lines of completed snow-drifts, with their bluff breast and tapering stern, resemble the body forms of cetaceans, fish, and birds, so also the cornices of incomplete snow-drifts and the cusps of barchans in snow or sand resemble some structures which are required to grip the fluid through which they move. They resemble, for instance, the arch of the wing which is so well developed in the heavier birds, assisting them to rise. In like manner the cusp of the incomplete snow or sand drift, by maintaining the eddy, enables the wind to collect the drifting material quickly on the lee side.

My friend Mr. E. A. Malan suggests that the bifurcating drifts, such as that in Fig. 36, which occur also in sand, not only recall the form, but also illustrate the steering function, of forked tails of the swallows and other birds.

APPENDIX.

ABSTRACT OF PAPER READ BEFORE SECTION E (GEOGRAPHY), AT THE MEETING OF THE BRITISH ASSOCIATION IN BRADFORD, SEPTEMBER, 1900.

On Snow-ripples, etc., in Scotland.

These observations were made in Scotland, in February, 1900. The general conditions during the following observations are: ground already covered with snow, temperature a little below the freezing-point.

Case I.—Snow falling sparsely. In absence of wind the surface was uneven, owing to clinging together of flakes. In a light breeze there was a notable tendency for the prominent parts to arrange themselves in ridges, the distance from ridge to ridge not more than 1 inch. When the breeze freshened these became regular ripples, with a smoothed surface of closer texture. One set of measurements gave the distance between successive ridges, 1·125, 1·225, 0·85, 1·05, and 1·00 inch (average 1·05). Their amplitude was approximately 0·05 inch, which gives a ratio length : height = 21 approximately. The steep face of these ripples is on the windward side, whereas in sand-ripples the steep face is on the sheltered side. The normal movement is downwind, the most noticeable feature of the process being the retreat of the steep weather-face, consequent upon the abrasion of its surface. For occasional short intervals, however, *during lulls and during moments of heavier snowfall, the ripples rush upwind*, owing to the sudden deposit of snow upon each weather face.

Case II.—Fresh breeze without snowfall, blowing upon uncompacted snow. The surface was beautifully covered by ripples of 3 inches to 15 inches from ridge to ridge, which were rapidly increasing in size. The steep side faced the wind. The ridges, which were pretty accurately parallel to one another, were transverse to the wind, but with much sinuosity, no ridge being straight for more than a few inches. It is evident that the wind must be concentrated in the re-entrant angles of the steep weather slope, and this would tend by rapid erosion to destroy the arrangement of long transverse lines, which is the most obvious characteristic of ripples. The ridges, however, did not lose their transversality, which was apparently preserved by the greater deposit of drifting snow in these re-entrants, which stopped the threatened gaps; and by the collapse of the overhanging cornice of snow at the salient angles, by which these promontories were truncated.

Case III.—The latest-fallen layers of snow having been blown away, the wind acts upon compacted snow (this was generally in drifts which had become exposed owing to change of direction of wind). The wind abraded a fine granular "drift," which did not adhere to the smooth hard surfaces. Parallel lines of bevelling or grooving transverse to the wind are the most conspicuous feature of the resulting structure in the compact, almost homogeneous, fine-grained material. The lines are much freer from minor irregularities than the ripples described above. As the action continues, however, the sinuosities are emphasized, for, the drifting snow not adhering well, the re-entrants are cut back more and more behind the salients. Further, the wind concentrating along the lines of the re-entrants, the general level of the surface there is lowered more quickly by abrasion than is the case along the intermediate lines of the salient angles. Thus is produced an intermediate form in which the transverse ridges are crossed at right angles by alternate ridges and furrows parallel to the wind, the furrows being along the line of the re-entrants.

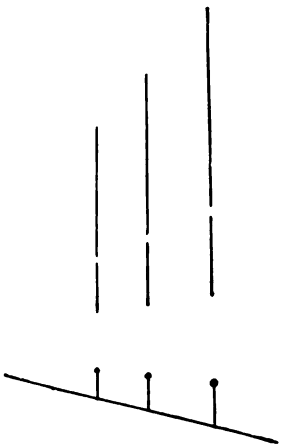
This action went on until the ridges transverse to the wind were merely a subordinate and scarcely noticeable feature, and the snow was seen to be in great ridges parallel to the wind.

SUN PILLARS.

A letter by the Author in "Nature," April 17, 1902 (*vol.* 65).

On January 19, 1901, during zero weather at Winnipeg, Manitoba, the fine icy particles which floated over the city as a cloud at 11 a.m. gave a halo round the sun with two mock suns, to the right and left, at the same altitude as the sun, and above the halo an inverted arc of about 120° showing prismatic colours. There was a good deal of wind at the time.

At night the wind dropped and the air became very still. The haze of icy particles descended, and in the middle of the night its illumination by the strong arc lamps of the city gave a column of light, comparable to a sun pillar, extending above each lamp to a height estimated at 300 feet. A striking feature of the phenomenon was the perspective effect, the columns diminishing in apparent height in such precise proportion to the increasing distances of the street lamps that it was evident the upper surface of the cloud of particles was truly horizontal. At this time the vertical columns of light were also visible below the lamps and extended to within a few feet of the ground. A few hours later, viz. at 4 a.m., January 20, the lower ends of the columns were more than 60 feet from the ground, and therefore far above the lamps. They extended to a height of about 300 feet, as judged by the distance of the nearest lamp and my elevation above the ground, which was about 60 feet. A narrow rift extended horizontally through the cloud, breaking each column of light into two parts. The figure is re-drawn from a rough sketch made at this time of the columns above three, only, of the numerous arc lamps.



The slight haze of minute icy particles which is common in zero weather is, I believe, called *poudrette* in Eastern Canada.

Before the reading of the paper, the PRESIDENT said: This evening we are to have a very interesting paper by Dr. Vaughan Cornish, "On the Snow-waves and

Snow-drifts in Canada." I now call upon Dr. Vaughan Cornish to read his paper.

After the reading of the paper, Prof. NORMAN COLLIE said: I am afraid I have very little to say on the subject of waves. But I can say a little about this country of Canada which Mr. Vaughan Cornish has travelled through in the depth of winter. I have not seen it under those conditions; I have only seen it when it has been under the hot sun of summer. Then the prairies were not covered with snow, but with grass, and there was no snow in the valleys, but only on the mountain-tops. Still, I think it says a great deal for the energy and perseverance of the Canadian Pacific Railway to run its trains every day through such a country, where the snow is sometimes 5, 10, 15 or 20 feet deep. The Canadian Rockies, where some of these beautiful photographs were taken, is going to be, I feel certain, the Switzerland of North America. It is a country which abounds in the most beautiful scenery, not only of magnificent rivers and pine woods, but there are glaciers and snow-peaks as well, and there is perfectly healthy air, where the people of the United States and Canada can go for their holidays in the summer-time. The pine woods then are not filled with snow, but with mosquitoes, especially during July and part of August, but in the latter part of August these mosquitoes go. In some respects the Canadian Rockies are very similar to parts of Switzerland, but the magnificent pine woods and splendid rivers are far finer than one gets in Switzerland; there are also beautiful lakes filled with trout, and snow-peaks, glaciers, and mountains. It is a country which, I have no doubt, will very soon be opened out and made into one of the playgrounds of North America. I am afraid I can add nothing on the subject of waves or drifting snow, because in summer-time, when I have been there, even right up on the mountains where there is perpetual snow in the summer-time, the snow is rapidly melting, and so one does not get any of these wave-forms. I am sure you will agree with me that these photographs we have seen to-night are revelations of the different forms snow can take up. One often notices these forms. Last Easter I was in Scotland, and the snow was many feet deep—in fact, about Easter there is more snow on the mountains than at any other time of the year, and in the drifts and on the tops of the hills one often sees these wave-like forms. One looks at them, passes them by and takes no notice, but after what we have seen to-night I think that the next time we see drifted snow we shall look at it with very much more interest, and, seeing the many curious formations, will understand how it is that the many marvellously beautiful curves are formed.

The PRESIDENT: I am sure we have all listened with great interest to this paper, which is one of a series that has been communicated to us by Dr. Vaughan Cornish. I have been struck, and I think we all must have been struck, with the great care and patience with which he has made these researches, and also with the acuteness of his observations. The scientific investigations, purely scientific investigations, he has made are of course of great importance, and as his paper proceeded, and as we listened to his former papers, I am sure we must all have felt that these purely scientific investigations would lead to useful and practical results in various ways. With regard to the snow-ripples, there is the well-known practice described by Baron Wrangell in Siberia, by which travellers in that vast region were able to steer when the sky was overclouded, by knowing the prevailing wind and understanding the forms which its influence caused to be taken on the ripples of the snow. He also relates how, when there have been light falls or drifts of snow in other directions, travellers would get out of their sledges and by sweeping away the upper surface of the snow, would reach the harder or permanent ripples. That is one way in which the knowledge of snow-ripples has been turned to a very practical use. Dr. Vaughan Cornish was showing me in the other room some of his photographs, which were examples of the way in which, by a knowledge of the formation of ripples in sand, one would be able to tell the direction of currents in mouths of rivers and estuaries. So I think we can congratulate Dr. Vaughan Cornish, not only on the great scientific value of his investigations, but also on the practical use to which many of them may be turned. I now ask the meeting to pass a unanimous vote of thanks to Dr. Vaughan Cornish for his valuable paper and for the beautiful way in which he has illustrated it by his photographs.

THROUGH THE GREAT CAÑON OF THE EUPHRATES RIVER.*

By ELLSWORTH HUNTINGTON.

A REFERENCE to the map of Asia Minor shows that the Euphrates river is formed by the union of two great branches. These for several hundred miles flow west-south-west in nearly parallel longitudinal valleys bounded by high ridges of mountains. The north-western branch, or Kara Su, although it is smaller than the other, is generally called the Frat, or Euphrates. Near Egin the mountains that bound its valley come together, and it is obliged to turn abruptly at right angles toward the south through a tremendous gorge, which it has cut directly across the southern range of the anti-Taurus mountains. Twenty miles below the gorge it empties into the larger branch, the Murad Su. The latter flows from north of Van nearly straight west-south-west to this point, part of the way through an unexplored cañon, said to be longitudinal and impassable. Below the junction of the Murad Su and Kara Su the Euphrates river makes a great bend to the south, and later to the east, and then, again turning south, zigzags through the Taurus mountains in a deep gorge. It is this great bend and the lower part of the two branches which I propose to describe.

Before proceeding to that, however, it will be well to get a general idea of the physical features of the surrounding country. We will examine these in geographical order, beginning on the south with the Taurus range. This rises here to an average height of 7000 feet, the lowest passes, except where the Euphrates and Tigris rivers cut through the range, having an elevation of about 5000 feet. The core of the mountains consists of a very old trap, the oldest formation of the region. This is broken in many places by eruptive granites and porphyries, which are older than the oldest stratified deposits. These crystallines are especially abundant on the north side of the mountains. On the weathered surface of these igneous formations are the remnants of a complex series of strata with several unconformities marking intervals of erosion so extensive that only the upper series of strata remain in large quantities. These are Cretaceous shale and limestone containing, among other fossils, numerous hippurites and nummulites. In post-Cretaceous times extensive elevation and mountain-building took place accompanied by considerable faulting. Probably it was at this time that the shale was locally much metamorphosed. The Cretaceous strata, rarely exceeding 1000 feet in thickness, form the tops of the majority of the mountains. Overlying the uplifted and highly eroded surface of this formation are numerous recent lava-flows, chiefly basaltic, which evidently took place after the country had assumed approximately its present topography. In several places there are cones of ash, and south of Lake Gyuljuk there is a crater enclosing a pond.

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* Map, p. 177.

This lake lies in a longitudinal valley between the northern ridges of the Taurus, in the neck of the great bend of the Euphrates river. Its position in respect to the latter is so remarkable that it deserves notice. The map shows that below Palu the river flows southwest directly toward the lake and in the same longitudinal valley. Fifteen miles from Gyuljuk it is turned west and north around the great bend already mentioned. After a course of 160 miles, it again enters the same great valley on the opposite side of the lake, toward which it once more flows, this time in a north-easterly direction, to a point 15 miles from the lake, where it turns south. The valley, which is everywhere a prominent feature in the topography, is occupied by six small streams beside the lake and the river, three flowing west and three east, two to the lake and four to the river; and in it, moreover, is the service of the main branch of the Tigris river.

The name Gyuljuk means "little lake," but the sheet of water is 12 miles long and from 2 to 3 miles wide. Previous to 1878 or 1879 it had no visible outlet.* For many years its borax-bearing waters had been steadily rising, and at that time overflowed to the Tigris. The older villagers, who live along the shores of the lake, say that they can remember a time when the water was 20 or 30 feet lower than it now is. Their fathers told them that in their young days it was possible to wade to an island which is now separated from the shore by water 75 feet deep. They had heard that still earlier the island was connected with the mainland, and was the site of the village which now lies on the mainland opposite. This is incontestably corroborated by the fact that on the island are the remains of an old monastery,† all around which may be seen the ruins of houses submerged in the lake to a depth of 25 or 30 feet. Part of the stones of the monastery are of a kind not now found

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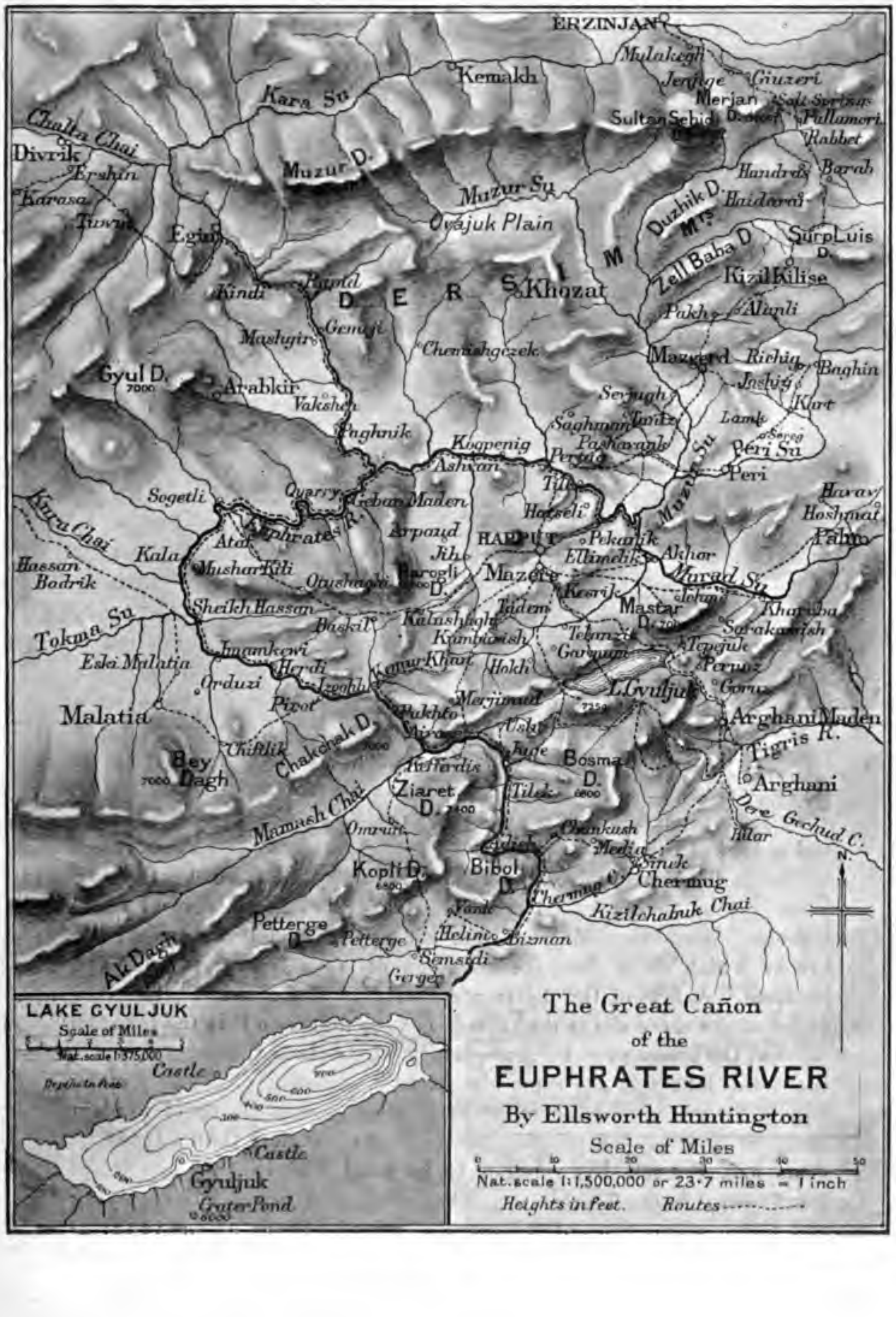
* H. F. Tozer, 'Turkish Armenia and Eastern Asia Minor.' London, 1881, pp. 239-246.

† *Verhandlungen der Berliner anthropologischen Gesellschaft*, February 17, 1900, pp. 144, 150-152.


The Great Cañon of the

EUPHRATES RIVER

By Ellsworth Huntington

Scale of Miles

Nat. scale 1:1,500,000 or 23·7 miles = 1 inch

Heights in feet. Routes

in the vicinity, but probably cropping out under the lake. Some villagers who know how to read say that in their church was an old book, unfortunately destroyed during the events of 1895, in which it was recorded that six hundred years ago the site of the lake was a plain, through the middle of which flowed a stream emptying into a hole at the lower end. This hole was later filled with silt, and the stream was thus dammed so as to form a lake. In 1899 I mapped the lake and took a number of soundings, from which the contour of the bottom was roughly determined. It is perhaps worth noting that at the east end, just where the villagers locate the ancient outlet, there is a very precipitous slope with a descent of 400 feet in 1100 feet. Another corroborative piece of evidence is furnished by two castles which were built between one and two thousand years ago, and stand on opposite sides of the lake, near the middle. Such castles are always built with a definite purpose, but under the present circumstances it is hard to imagine what use they could serve, as there is nothing for them to defend. If there were no lake, the shortest and easiest road from Harput to Diarbeker, as determined by the location of passes, would go directly across the lake-basin from one castle to the other. Hence they lend additional certainty to our conclusion that no lake, or only a very small lake, existed here one or two thousand years ago.

Accepting this conclusion, it is clear that the present shore-line is along an old beach. In twenty or twenty-five years a small lake like Gyuljuk would be utterly unable to have much effect in producing a bench along its margin. The beach as now seen, however, consisting of sand and pebbles, is fairly continuous, although broken in many places by projecting cliffs, especially on the north side, where the shale dips away from the lake; and in some parts the beach is 40 or 50 feet wide, and is backed by a second line of wave-worn material lying 6 or 8 feet above the lake-level, which has been lowered by a trench dug twenty years ago at the outlet. Behind this upper beach are several small lagoons. While discussing the beach, it may be said that all the little brooks which enter the lake have fan deltas of coarse pebbles and boulders. A few of the deltas are nearly 1000 feet wide. The condition of the shore shows that this is not the first time that the lake has stood at the present level. Accordingly we conclude that in prehistoric times the lake was the same size as now. Somehow it was drained wholly, or in large measure, and so in early historic times a plain occupied most of the present lake-bed. At last, less than a thousand years ago, the lake-basin began to be filled, and in 1878 the water overflowed into the Tigris river. The traditional cause for this emptying and filling seems the only adequate one. Violent or extensive earth-movements are utterly out of the question, because there is not the slightest sign of them, the present shore-line agreeing exactly with the old one. Changes in climate are impossible as an explanation, because a reduction in rainfall sufficient to cause the lake to shrink to the size which it must have assumed, would have made the surrounding country a desert at the beginning of our era, which, as every one knows, is contrary to the facts of history. Therefore we seem to be justified in assuming that somehow a passage was opened in the bottom of the lake; most of the water was drained off; later the hole was filled, probably by the deposition of silt, and so the lake was restored to its former condition.

North of the Taurus mountains is a great lozenge-shaped basin, from the two ends of which flow the Murad Su and Tokma Su in opposite directions towards the centre. This is floored with a series of plains formed of a fine alluvial deposit and broken by a number of small mountain ridges. Cretaceous strata are abundant in these ridges, but their lower layers contain more sandstone and conglomerate than do the corresponding strata further south. North of the plains lies the southern half of the anti-Taurus mountains, in which may be included the great Dersim range. The old trap, the Cretaceous strata, and the later lava-flows are well represented, and there is a large development of limestone, seemingly older than the Cretaceous, although its age has not been determined. This is especially abundant among the highest mountains, those around which the Kara Su flows, where it turns from

A RUINED BRIDGE OVER THE MUZUR SU, NEAR MAZZERD.

a westerly to a southerly course, and in the lower mountains farther west. It reaches its maximum development in Muzur Dagh, where the thickness from the river at Egin to the top of the mountain appears to be 8000 feet. Between the two great divisions of the anti-Taurus mountains lies another series of alluvial plains at an elevation of from 4000 to 6000 feet. They are to Asia Minor what Tibet is to Asia Major. Through them flow the Kara Su from the east and the Chalta Su from the west, meeting a few miles above Egin. The former flows on the surface of the larger plains, but on the sides of the latter river the plains lie at a much higher elevation, and have been cut by the river to a depth of 2000 feet.

Such, in brief, is the country where the Euphrates is formed by the junction of two large streams, and changes its course from eastward to southward. The main roads have been often traversed and described by travellers, but most of the region is very imperfectly known. The great general Von Moltke was the first to investigate the course of the Euphrates river, as it zigzags through the mountains.* In July, 1838, when the water was at its lowest, he floated down on a raft from Palu to Birejik, finding the first 125 miles to Kemur Khan easy, but farther down, in the gorge through the Taurus mountains, meeting with the greatest difficulty because of rapids. A second attempt in the spring of the next year, when the water was high and the rapids more dangerous, had to be abandoned at Tilek near the beginning of the greatest cañon. Since that time no one, so far as I can learn, either native or foreigner, had attempted the journey through the lower gorge until in the spring of 1901 it was my good fortune to accomplish it in company with Prof. Thomas H. Norton, U.S. Consul at Harput.

Starting from that place, we rode to Akhor, on the bank of the Euphrates, at the eastern end of the Harput plain. The people of this village, Armenians, make a business during the winter of floating down the river to Kemur Khan on rafts of skins, fishing as they go. These rafts are known as kelleks, and the raftsmen as kellekjis. As there are no equivalent English words, I shall employ the Turkish terms. At Kemur Khan the kelleks are taken to pieces, and together with the fish loaded on donkeys sent by land across the neck of the river's bend to meet them. The fish are sold at Harput, and the rafts are taken back to the village, whence they start again. We had engaged two of these fishermen to take us down the river as far as we should choose to go, with the condition, imposed by them, that they should be allowed to make a portage around one dangerous rapid, of which they had heard, in the lower gorge below Kemur Khan. We sent our horses by land across the narrowest part of the bend of the river to Chunkush, and thence to Gerger, and on the morning of Friday, April 12, were ready to begin our voyage.

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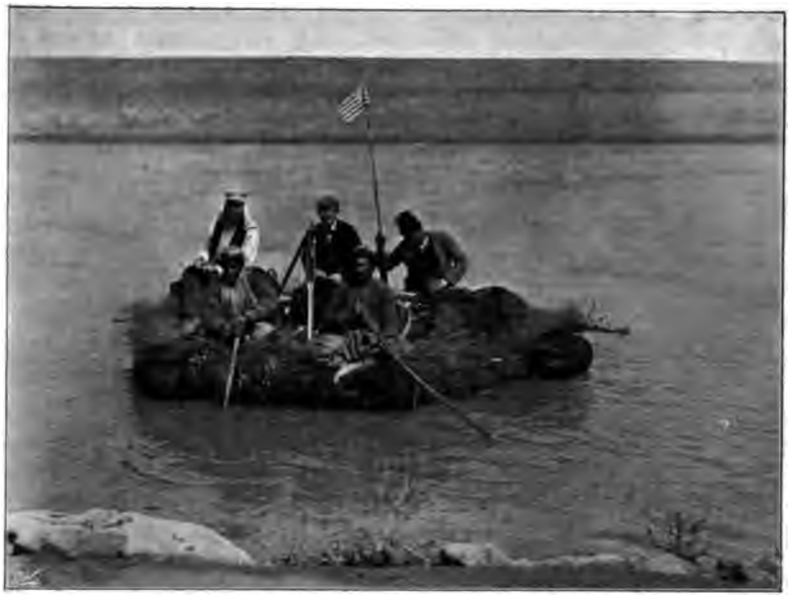
* See Moltke, H. von, 'Briefe über Zustände und Begebenheiten in der Türkei au den Jahren 1835 bis 1839.' Berlin, 1876, pp. 289-291, 360-363.

The making of the kellek took some time, although in the evening a number of entire sheepskins had been well soaked and left wet so that they might be pliable and ready for immediate use. In the morning they were inflated by blowing through the necks, the legs being securely tied so that no air could escape. At first the mouths of the blowers were at a distance of 8 or 10 inches from the necks of the skins, but as the latter became fuller and more difficult to inflate, the men's mouths were brought nearer until they touched the skins. When a hole was discovered, it was quickly mended by putting a piece of wood like a checker against the inside of the hole and tying the skin firmly around it. A light frame of saplings was tied together with ropes, and under this were tied the skins, about thirty in number, with the legs up. They were packed together so closely as to make the kellek water-tight. Thirty skins seemed to us very few for five people, but the fishermen's rafts consist of only six, and two men sit on one such kellek. The kelleks always go in pairs on long fishing-trips.



KELLEK ON THE MURAD SU, NEAR ASHVAN.

As the spring of 1901 in Turkey was unusually dry, the river was comparatively low, being about halfway between the extremes of flood and low water. As it was, the current seemed very swift even in the plain at Akhor. As soon as we began to float, we concluded that a kellek moves in the easiest, most delightful way that can be imagined. There is no jar or shake. The buoyant skins and pliant saplings adapt themselves to every movement of the waves. Half an hour after starting, we stopped for some time while the kellekjis gathered a great quantity of weeds, which they spread over the raft, partly to protect the skins from injury by our feet, but still more to prevent them from drying in the hot sun and cracking. Every hour or two they threw water over all exposed portions of the skins.

On the plain half a mile from this place, near the village of Elimellik, is one of the many artificial mounds which dot the plains of this region in large numbers, and which contain polished stone hammers, bone knives, and other implements. This mound is small, only 200 or 300 feet in diameter, and insignificant except for one thing. Close beside it flows a mill-race, which has undermined one side so that a perpendicular section is exposed about 30 feet high. About 12 feet above the level of the plain is a horizontal stratum of water-rolled gravel, 2 or 3 inches thick. Above and below this the mound is composed of loam filled with bits of pottery. Clearly this mound was built to a height of 12 feet, and then submerged under some body of water long enough for the layer of gravel, and probably for some layers of finer material, to be deposited. The water then retired, and men again occupied the mound. The cause of this submergence is not clear. The first thought is that it was due to a river flood of unusual height, but under present conditions this would be impossible, for the highest level of the water is now 30 feet below the mound, and the range from high to low water is not more than 15 feet. Moreover, if a flood reached to the mound it would not deposit gravel, but sand or finer material.

A short distance below this mound the river enters a gorge, and a series of small rapids is formed. It here turns north by west, and passes transversely through the small Harput range of mountains. The gorge, cut almost wholly in basalt, has walls 1500 feet high on the south side, and 2500 feet on the north, the distance between the two summits being but little more than 3 miles. Halfway between the entrance to the gorge and the mouth of the Muzur Su, an imposing basaltic rock rises in the middle of the river to a height of 60 feet. On the side down-stream, where alone it is possible to land, is an artificial platform, from which a flight of rock-hewn steps leads to the levelled top. A few other places where ascent might be possible have been protected by walls. On the right bank of the river close by is a cliff, in which has been cut a cave about 20 feet deep. From the back of this ascends a flight of seventeen steep steps, leading to an opening which commands a fine view up the river. The style of work shows that this was a fortress of the Haldis, or Näiri, those unconquerable enemies of the Assyrians of whom we have lately learned so much through the labours of Drs. Belk and Lehmann, especially the latter. The location of a castle here, where there could be no bridge, and where the road along the river-bank is very difficult and much longer than over the mountains, and the fact that the watch-cave faces up, not down, the river, indicate that it was built to guard against enemies who came down the river itself. Probably they used to float down the river on kelleks 3000 years ago just as they do now.

LOOKING DOWN THE EUPHRATES FROM THE OLD MARBLE QUARRY NEAR KEBAN MADEN.

The next point of interest below the castle is the mouth of the Muzur river, a large and very swift stream with remarkably clear and cool water. Rising in the mountain-girt plain of Ovajuk, and fed by the springs of the great Dersim mountains, from the north side of which the snow never disappears, it always has a full stream navigable for kelleks from the plain to its mouth. Its largest branch, the Peri Su, 150 miles long, rises near Bingyul Dagh, south of Erzerum, and in spring is larger than the main stream. Thirty miles above its mouth, near the old ruined town of Baghin,* with its Haldi fortress and two cuneiform inscriptions, it passes through a gorge on the two sides of which hot springs gush out in numerous places. For a quarter of a mile the river is confined between perpendicular walls covered with stalactites 40 or 50 feet long, the deposit of the springs.

Passing the mouth of the Muzur Su, we soon came to a ferry owned by one of the few beys, or feudal lords, whose power is still absolute. His Kizilbash retainers, a few days before our visit, had stolen the ferry-boat from Akhor, our raftsmen's village, in order to use it in ferrying wood to be sold in Harput. The mountains south of the river are wholly deforested and the Kurds are rapidly cutting the small growth that remains in Dersim. The men at the ferry got out their old flintlock guns and tried to force us to pay for floating past the place where they had the ferry rights, but our hats overawed them.

Below this the river leaves the mountains, but the valley is still hemmed in on the south for some miles by a wall from 500 to 800 feet high, capped with from 50 to 100 feet of basalt, the edge of a lava-flow which came from the mountains north-east of Harput and reached the edge of the river-valley, but apparently did not fill it. From here the river flows for 30 miles through low hills and plains broken only at Pertag. The first village passed on the right is Till, which must once have been an ecclesiastical centre of some importance, since there are the remains of seven Syrian churches, beside those of baths and houses. Indeed, the whole of Dersim is full of relics of the Christian population, Armenian and Syrian, that once filled it. At Pertag, close to Till on the same side, ruins of other kinds are found. From far up the river the picturesque castle is seen on its high pointed rocks. It was first built by the Haldi and last rebuilt by the Seljuk Turks, but no one knows by how many races it has been occupied between these extremes. At the base of the castle are the ruins of several mosques, churches, and baths, and of hundreds of houses. At the beginning of this century Pertag seems to have been a large and flourishing town, but in 1839–40 troops were brought here and quartered in the houses of the people, who promptly moved to their beautiful well-watered gardens, an hour away to the north-east at the base of the mountains. When the soldiers finally departed, the people did not care to return to their injured houses. Some ferrymen and a few zaptiehs, gens d'armes, are the only inhabitants of the old town. A fair is held here every Friday morning, and is attended by Christians and Mohammedans from all sides.

The river here cuts through a great boss of granite porphyry which rises in the sharp castle rock on one side and in a magnificent dark cone, 1000 feet high, on the other. Along the river the rock forms fine though small columnar palisades. Just west of the castle, where the river leaves the palisades and enters a region of black basalt, we discovered the ruins of an old Roman bridge, which formed part of the road from Harput, through Kuttu Dere, in the midst of Dersim, to Erzinjan. This route *viâ* Erzinjan is the shortest from Harput to the Black Sea at Trebizond, but it is not now used, because the Kurds in the mountains through which it passes make travelling very unsafe. The makers of the bridge utilized as piers two islands, on the larger of which massive limestone blocks still remain in place. The rest of the way to the Kara Su the scenery is uninteresting, the open valley being cut through limestone, which forms low rounded hills a few miles back from the river. On the right bank one of the villages is Kogpenig, where many of the inhabitants live in caves. At Ashvan a model farm is being conducted on American principles under the direction of Prof. Norton.

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* *Verhandlungen der Berliner anthropologischen Gesellschaft*, November 18, 1901, pp. 174–180.

The mouth of the Kara Su is disappointing because its appearance is not equal to its geographical importance. Both rivers flow slowly here, and approach each other from nearly opposite directions—a most peculiar configuration for well-established rivers of such size. In the summer of 1901, I floated down the Kara Su from Egin to the Malatia plain. The cañon at Egin is one of the finest in Turkey. Two miles above the town the narrow stream flows between solid walls of hard limestone 400 feet high, which even, when looked at from a distance, appear to be really perpendicular. Above these perpendicular walls the steep rough limestone rises 4000 feet on the west side in a distance of only 4 miles, and on the east side 8000 feet in scarcely 8 miles. Trees and vegetation are almost lacking, and the landscape is all brown and grey; yet, in spite of the bareness, it is grand. Egin itself, thanks to the great springs, is completely hidden in trees, so that the contrast between the green city and the bare mountains is most striking. In floating down the stream, the mountains are soon left behind, and the old limestone falls lower and lower, until at last it forms a wall but 10 feet high. Over this lie sandstone and much rough conglomerate, which seem to be a part of the great Cretaceous deposits. On both sides of the river the land rises 1000 feet or more in broad irregular terraces to a partly dissected plain covered with alluvium. Near the mouth of the Kara Su, the old limestone rises again in rounded hills from 400 to 1000 feet high. On the Kara Su below Erzinjan only one dangerous rapid occurs, 15 miles below Egin, and it is dangerous only because of the great number of stones in the middle of the channel. It is worthy of note, as an indication of the age of these streams, that, although the grade is in some parts steep, it is rarely broken by ledges and sudden descents. Except in the cañon between Kemur Khan and Chunkush, the rapids of both the Kara Su and Murad Su are usually due to accumulations of gravel brought in by side streams.

The mouth of the Kara Su lies at the head of a second winding transverse gorge cut through limestone except at Geban Maden, where there is an outcrop of trap in which are silver mines. The raftsmen told us that 2 miles above Maden there were traces of another bridge, which, however, proved to be a quarry with a series of flat steps full of drill-holes, and cut into the face of the steep cliff in such a way that blocks of the beautiful variegated marble could be loaded on to rafts with the greatest ease. Where the marble was carried is not evident, as none of it has been noted in neighbouring ruins. The passage through the real gorge, beginning at Maden, occupies four hours with a swift current, and in spring some good rapids, which are scarcely noticeable in the lower water of summer. The limestone walls tower very steeply 1000 feet or more, and above that height the mountains rise another 1000 or 2000 feet. Hundreds of pinnacles and peaks rise like countless castles separated by gigantic clefts. Here a little tributary comes at the same level through a cañon with perpendicular walls; there a sheer cliff rises 500 feet; close by, the massive strata are crumpled like paper or are set at various angles by great faults. Where the strata are horizontal, the wall is benched with terraces from 20 to 60 feet high, each bearing on its top a strip of beautiful green grass in delightful contrast to the prevailing buff grey of the mountains and intense blue of the sky. Almost the only inhabitants are big-horned ibex and wild blue pigeons, which make their home in the numberless inaccessible caves which honeycomb the limestone from top to bottom. In the intense heat of summer, when everything dries up and the cañon is like a furnace, even these are not seen. Near the lower or south-west end of the gorge the walls grow steeper as they decrease in height, until the river passes out into the Malatia plain from between perpendicular limestone walls, here only 40 or 50 feet high.

The Euphrates, now turning south, skirts the base of the western extension of the Harput mountains, entering but slightly the great Malatia plain which stretches 20 miles to the west. The inhabitants on both sides are for the most part Kurds, those on the left of the river being largely Zaza, those on the right, north of the Kuru Chai (*Chai*=brook), being Kizilbash, and those on the right, south of the Tokma Su, Kurman; while the area between the Kuru Chai and the Tokma Su, very fertile, but not easily irrigated, is practically uninhabited. The Kizilbash are the most interesting of these three divisions of the Kurds. They are a mixed race, the foundation being some tribes of a stock allied to the Persians, who advanced into Turkey along the central highlands. These mountains were inhabited by Armenian Christians, who under stress of persecution became nominal Mohammedans and intermarried with the invaders. The

Kizilbash in the district near Malatia, unlike their brethren in Dersim, are peaceable, well-behaved agriculturalists, most of whom have entirely given up nomadic life. In general the Kizilbash are a frank, good-natured people, eager to be amused, very ready to ask and answer questions, hospitable, easy to deal with, industrious when work is necessary, and faithful when they have given their word, although very ready to rob and even to kill those to whom they are not under obligation. Morally they are superior to their neighbours. They deteriorate rapidly under new or adverse conditions, becoming more suspicious and treacherous. When among the Turks, they swear that they are good Sunni Mohammedans, although in reality their religion is a mixture of Shiite Mohammedanism and Christianity, with perhaps a trace of primitive paganism. Accurate information is hard to obtain, because in talking with a Christian they try to make their religion appear like Christianity. For instance, a prominent agha, or village chief, said to me, "We have four great prophets, Adam, Moses, David, and Jesus, of whom Jesus is the greatest. We have four holy books, the Gospels. All religions are but different roads to the same end—one long, one short—one easy, one hard. You go yours, and we go ours." When I tried to talk about Mohammed, he avoided the subject as though it were unpleasant, so that I could learn nothing. The Kizilbash never pray in private, but only when led by one of their sehids, or religious chiefs,

IN THE CAÑON BELOW KEBAN MADEN.

who have great influence among them, and who go freely and safely from tribe to tribe even during times of feud. So common are feuds, and so respected are the sehids, that the business of conducting travellers or of carrying freight is wholly in their hands. At certain times they observe a sort of sacrament, which closely resembles the Christian Communion Service. No competent observer seems to have witnessed this, and it is known only by report. The Kizilbash reverence all Christian sanctuaries and churches, and will even go into a church where service is being conducted, and take part, kneeling and bowing with the people. To be sure, they will do the same thing in a Sunni mosque, but in the latter case it is for fear of persecution, while in the former it is a matter of their own inclinations.

The Euphrates, as it winds through the Malatia plain, flows slowly and divides into a network of channels, enclosing islands of sand or gravel nearly level with the flood-plain. The latter, often half a mile wide, is bounded by bluffs from 30 to 50 feet high, cut in the alluvial deposit which forms the Malatia plain. Villages, especially on the left side, are numerous and prosperous, being usually beyond the flood-plain, although some lie at its edge.

At Kala, close to the most western point of the great bend, there is, on the left side of the river, a large rock, which the Haldis, or Naïri, long ago fashioned into a castle by excavating platforms and steps, and building walls. Behind the village, on the steep slope of Mushar mountain, are situated several famous holy places. The first, 400 feet above the river, is a raised platform of stone and mud, said to be the grave of an Armenian girl who cared for the great church on the top of the mountain. The Kizilbash aghas of the village are honoured by being buried here, although the common people must be content to lay their dead by the river. Five hundred and fifty feet higher is found a Turkish holy place, the grave of a man called Hassan, in a small cave, which has been walled in and furnished with many gaudy and some valuable offerings. Outside is a great square altar of rough stones, all covered with the gore of the scores of sheep and goats, which are brought as sacrifices by both Christians and Mohammedans, and which are cooked in huge copper caldrons hung from great beams. The horns of the offerings are piled on another altar, and the meat is often eaten in the holy place itself, the bones being thrown into a little cave back of the main cave. The shrine has no guardian, but it is regarded with such veneration by men of all religions that the most valuable of the offerings are perfectly safe from pilferers. The third, and least visited, holy place is an old well-built church with massive buttresses and arches, located on the bleak mountain-top 2400 feet above the river. A more unpromising or inaccessible site for a church can hardly be imagined. The view from Surp Aharon, as the Armenians call the church, or Mushar Kilise, as the Turks call it, is very extensive, including the snow-capped Dersim and Anti-Taurus mountains on the north, the western extension of the Harput mountains on the east, the Taurus mountains on the south, and on the west the broad brown expanse of the Malatia plain, bounded on the east by the blue network of the Euphrates, and on the west by the range of Aghaja Dagh, cut by the V-shaped cleft of the Tokma gorge.

Returning to the river, the reedy, bushy islands, or the banks of shingle between the branches of the river, are the resort of all kinds of water-birds—ibis, black divers, storks, bustards, herons, cranes, and many smaller birds. The current was slow and the voyage monotonous as we floated past the mouth of the Kuru Chai, whose valley the Malatia-Sivas road follows for two days' journey, and past the large Tokma Su from Gurun and Derende, until we reach Pirot, where the road crosses the Euphrates. Here the mountains again approach the river, leaving on either side a strip of smooth green fields dotted with trees and houses. Behind this on the right rises the first ridge of

TRIPLE ROCK, IN THE GORGE AN HOUR BELOW KEBAN MADEN.

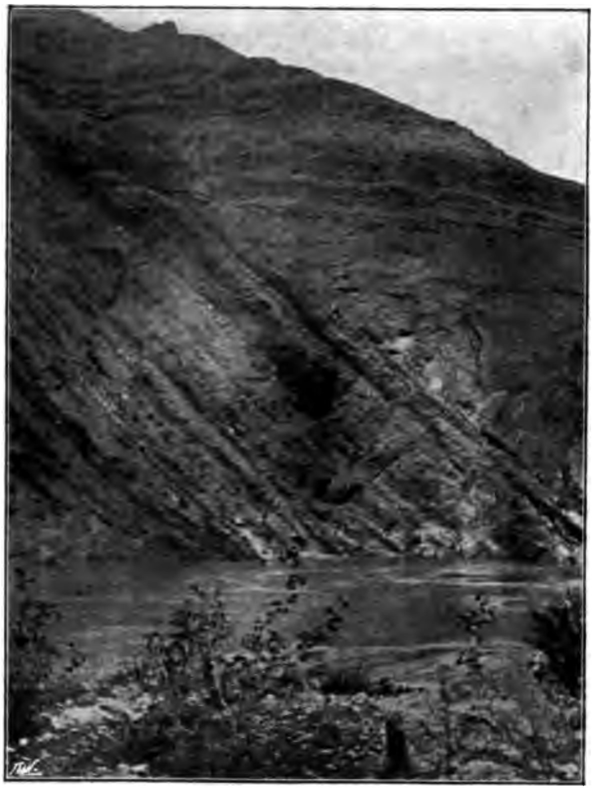
the Taurus, from 4000 to 5000 feet above the river, and green clear to the snow-line, where verdant wheatfields lie close to snow-filled valleys from which shining little brooks tumble down the steep slope. Although the view is not wild or grand, it is most attractive, because of its quiet strength joined with real verdure—a rare element in the landscape of Eastern Turkey.

For 6 miles we skirted the base of the mountains, which, approaching gradually nearer the river, cause it to become more narrow and swift. Near Kemur Khan, on the left side, is a cuneiform inscription recounting an expedition of Tiglath Pileser, and speaking of a certain bridge, presumably over the Euphrates. Just up-stream from the inscription is a fairly narrow place in the river, with low cliffs on either side which might readily serve as piers of a bridge. As we passed this point, our kellekjis volunteered the information that they had heard from their fathers that in old times there was a bridge here, of which they—the fathers—had in their youth seen a few stones.

At Kemur Khan the river turns at right angles and goes south by east through a remarkably straight gorge 12 miles long and nearly 4000 feet deep. The scenery is even finer than in the preceding gorges. The dark, steep, gloomy walls of basalt and metamorphic shale are terraced at an elevation a few hundred feet above the river, and on each terrace or nestled in each tiny valley are one or two houses and a patch of bright green fields. In some cases the fields are on slopes so steep that it seems as though the sower could scarcely find a footing. Far above the fields white patches of snow contrast strongly, in spring at least, with the black and green walls of the cañon, and send little streams cascading down through rough gashes in the resistant rock, amidst a chaos of huge boulders and trees. In this gorge our real difficulties began. Our Armenian kellekjis, who knew the river thoroughly, as far as Kemur Khan, were now beyond their accustomed track and ready to be afraid of everything. The first rapid in the gorge looked to them so bad that we made a portage of between 2 and 3 miles around both that and the next rapid, climbing 1200 feet up the steep slope over the roughest kind of road. If the kellekjis had not been so timorous, the rapids might easily have been shot, and we should have been saved twenty hours.

As we were about to embark below the portage, after a night spent on the river-bank, a raft of logs passed us manned by two almost naked Kurds, with wooden tridents in their hands, and strings of gourds around their waists for life-preservers. They carry wood from Izoghlu through the Kemur Khan gorge to Kefferdis. We followed the men, and after a few minutes shot a fairly large rapid, at the bottom of which was a big whirlpool. Our men, with their spoon-shaped walnut paddles, were able to pull us out of it, but the Kurds could do nothing with their tridents, and were carried far up-stream. Finally they had to land and haul their raft down to a point below the whirlpool.

Through the whole length of the gorge we went at an average rate of 5 miles an hour, between walls of solid rock which come down sheer to the narrow stream, and are broken only by precipitous gullies entering at grade and bounded by jagged cliffs with needle-like points. The mouths of these gullies are footed by fan deltas, which have been pushed out into the river, forming dams, over the outer ends of which the water pours in foaming rapids. We shot into these over smooth rounded waves, like the long swells of the ocean, but in a moment were among the breakers, which tossed the light raft up and down like a cork, and often came over us, breaking up-stream, as is usual in rapids. The kellekjis paddled with all their might. The raft spun round and round, so that we saw the wild mountains on every side without turning our heads.

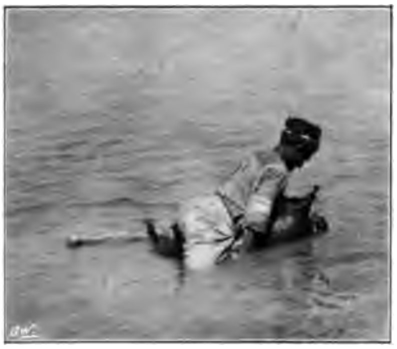


FAULT IN THE GORGE BELOW KEBAN MADEN.

Near the end of the gorge, where the mountains become lower, a good-sized brook from Morjimud, coming in on the left through a fine cañon, has built a large fan. The size of the rapid thus formed frightened our kellekjis so much that we could not persuade them to shoot it, and were obliged to spend two hours in letting the kellek down past it by ropes. While we were doing this, the Kurds on the wood-raft overtook us. Lying flat on the logs, they shot through, not over the rapid, going into wave after wave with 4 or 5 feet of water over them, and coming out at the bottom with a triumphant yell.

At the mouth of Mamash Chai we left the transverse cañon, and turned at right angles to the east by north into the broad longitudinal valley in line with Lake Gyuljuk. On looking into the valley from any of the surrounding mountains, it appears so broad and well matured that one feels certain at first that the Euphrates must come down its whole length from the west-south-west, the actual cañon of the river seeming to be merely the bed of a short tributary. The part of the main stream in the open longitudinal valley and the tributary, Mamash Chai, lying directly in line with one another and at right angles to the transverse cañon, have incised in the valley-floor a steep-sided trench from 150 to 250 feet deep, and wholly filled at the bottom by the streams, which flow between rock walls without a flood-plain. Most of the valleys in this immediate region show the same feature of a flat-bottomed old valley with a small trench-like new valley, without a flood-plain, incised in the floor. Thirty miles north in the Harput mountains such newly incised valleys are not found. They occur on a small scale 30 miles north-west, in the western extension of the Harput mountains, around which flows the Euphrates river, and again 20 miles further east, in the valley of the Tigris river. Probably this conformation is due to an uplift of the region at a comparatively recent date, affecting most strongly the Taurus mountains where they are traversed by the Euphrates river. The minimum elevation seems to have been at least 500 feet. The immediate vicinity of Harput may have been unaffected, or, as is equally probable, the cutting down of the bed of the Euphrates has not yet proceeded far enough up-stream to affect these mountains, although they may have been uplifted. In the Tigris basin the very small dimensions of the newly incised valleys may be due to slight uplift or to the comparative slowness with which the small stream of the upper Tigris scours out its bed. The 8 miles of the course of the Euphrates, along the open longitudinal valley in line with Lake Gyuljuk, are over numerous rapids, caused not by fans but by inequalities in the bed-rock, and thus indicating that the revival of the river by uplift of the surrounding country is very recent.

Near Aivose, just below the ferry where the road from Harput to Shiro crosses the river at the head of a dangerous rapid, which, unlike those just above it, is caused by a detrital fan, thirty or forty of the villagers tried to prevent us by force from going further, but were soon persuaded to take up our craft and carry it a quarter of a mile around the rapid. They could not understand why any one should make such a dangerous journey, and especially why any one should take notes all the time, and so, with oriental logic, they concluded that we had some secret purpose which must be opposed to their interests. Our own servants were equally unable to understand our purpose, although I tried to explain. Often I heard them answering the questions of inquisitive villagers, "What are these men doing?" "We don't know. Perhaps they are going to make a bridge, or a wagon-road, or a railroad. More likely they have a secret commission from the king. They say they are not paid for making this journey, but we know better; they are not such fools as all that. They know everything: they see a stone or a plant, a brook or a mountain, and they know it. They even know what is in a place before they have visited it. They write everything. If you want to know any more, ask them. What do we know?"



KUZZLEBASH KURD CROSSING THE EUPHRATES ON INFLATED SHEEPSKIN.

The villagers at Aivose feared not only that we should harm them, but also that we should be drowned, in which case the Government might hold them responsible for the foreigners, the "men with hats." The people here, as well as many others with whom we talked, both above and below this point, asserted that no one ever had navigated or could navigate the river from Aivose to Chunkush. Von Moltke's journey seems to have been forgotten.

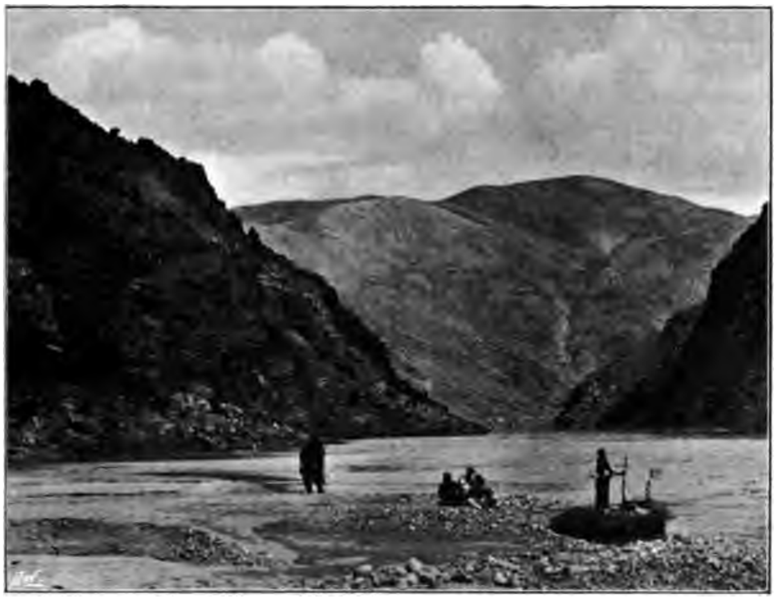
Leaving the villagers, who had become quite friendly as they carried our goods around the rapid, we boarded the kellek once more, and in less than ten minutes were at the angle where the river, turning once more to the south from the longitudinal valley, enters an immense crooked transverse cañon, the last and longest of the great gorges, 30 miles long and 5000 feet deep. Before we knew it we were at the head of a rapid worse than any that we had yet shot, or around which we had made portages. It seems to be due partly to the structure of the bed-rock and partly to the fan of the Uslu brook, which flows into the river just in the middle of the rapid over a series of small cascades, which, as seen from the river, appear to be caused by the brook's own fan. The kellekjis wanted to make another portage, but we insisted on shooting the rapid. Although we made the passage safely, the men's nerves were so completely unstrung that when we landed soon after at the head of another large bed-rock rapid, they absolutely refused to go on. One was sent to find a village and get men and animals to help in making a portage. He found a village after a hard climb of an hour or more, but instead of going to it he hid till after dark, and then returned to us, because, as he said, if the Kurds knew that we were encamped beside the river, they would come and rob or even kill us during the night. The other Armenian, when told to take some baggage off the safely moored kellek, said, "If I ever set foot on that kellek again I know that I shall die. Then who will take care of my wife and children? You haven't any hearts. The mountains are savage, the river is savage, the people are savage, but you don't fear them. Don't you even fear God?"

He was full of superstition and was in terror, partly because he had dreamed the night before that some of his friends were dying. This night he dreamed that we Americans were shooting pistols, which, curiously enough, seemed to encourage him greatly.

In the morning we made our portage, a long hard one involving a climb of 900 feet up out of the steepest parts of the cañon, and at twenty minutes past five in the afternoon were ready to embark, 2 miles from our camp of the previous night. Floating very rapidly for nearly an hour, we passed the sulphurous hot springs of Tilek, which rise on both sides of the river below high-water mark. They contain chiefly hydrogen sulphide and calcite. In July, 1900, I visited them and found the temperature to be 114° Fahr., while that of the surrounding air was 103° Fahr. at 4.30 p.m. On account of the inaccessibility of the springs, they are but little visited, although reputed very beneficial for skin and rheumatic diseases. The favourite method of treatment is to bathe the patient half an hour, and then bury him up to the neck in the hot river sand for two hours, repeating this process four or five times in a day.

Near Tilek the river turns more directly south and passes through magnificent scenery. At the bottom, schist, formed by the metamorphism of shale, forms almost perpendicular walls, which we estimated as nearly 400 feet high. Above is a terrace, from which green wooded upper walls rise less steeply to the mountain-tops a mile above our heads. The larger tributaries cut through the apparently perpendicular lower wall in steep-sided narrow cañons, entering the main stream at grade, while several small streams have not yet cut down to grade, and cascade over the cliffs in a series of white falls.

These hanging valleys and many other characteristic features of the Euphrates cañon correspond closely to what is described in the Grand cañon of the Colorado river, showing that the two rivers are of nearly the same age. The Colorado cañon is much longer than that of the Euphrates, and is cut through a plateau of nearly horizontal strata instead of through a range of mountains formed of much distorted strata; but in both cases the depth of the cañon and the inclination of the walls, very steep at the bottom and more gentle above, are approximately the same. Both rivers are so young that they have not yet established thoroughly graded channels, but no waterfalls are found such as we should expect in extremely young streams.* There are, however, the two kinds of rapids which I have already mentioned, viz. those due to outcrops of hard rock which have been worn back so far as to present a regular but nevertheless very rapid descent, and those due to the damming of the stream by fans of detritus brought in by tributaries. It was by these that the famous journey of Powell down the Colorado was made so dangerous.† We found that as a rule the bed-rock rapids are longer, but the fan rapids are more steep and dangerous. They indicate that the rivers are approaching, but have not yet reached, the stage of maturity, when the whole channel assumes a graded character.



ENTRANCE TO THE GREAT CAÑON AT KEMUR KUAN, LOOKING SOUTH.

The junction of the side streams with the main river is another interesting indication of youth. The majority, as has been said, enter at grade through narrow steep-sided cañons, but some of the smaller tributaries and a number of wet-weather torrents have not been able to carve valleys as rapidly as the main stream has incised its cañon, and so have been left hanging at various levels on the cañon wall. They are in marked contrast to the hanging valleys described in glaciated countries such as Switzerland and Norway. The latter enter main valleys far broader than the streams that occupy them—so broad, indeed, that the main rivers have room to wander over wide flood-plains, bordered often by narrow strips of plain which graduate into the steep valley wall without any sudden angle. The others, on the contrary, send their streams cascading over the precipice directly into the Euphrates river, whose valley is so narrow that not only is there no flood-plain, but the water washes the rocky base of the almost perpendicular cliffs. The Colorado river, it will be remembered, has just such hanging valleys where it passes through the harder crystalline rocks. These two cases, where the discordance of side valleys seems to be incontestably due wholly to river-erosion, are in such marked contrast to the discordance of valleys of glaciated countries, that it is very hard to believe that the latter could have been due to river-erosion. If we regard them as the product of glacial erosion, we have what seems to be an adequate explanation of their difference from those that are certainly of river origin.*

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* See Gilbert, G. K., Engineer Dept. U.S. Army, 'Report upon Geog. and Geol. Expl. West of 100th Meridian,' vol. iii. (Washington, 1875) part i. pp. 70-75.

† See Powell, J. W., 'Exploration of the Colorado River of the West and its Tributaries.' Washington: 1875.

In the middle of the fan delta of Haloge Chai, a small tributary of the Euphrates which enters the main stream at grade, lies an immense white boulder, 30 feet in diameter, on the top of which are perched a number of boulders of other kinds, small only in comparison with the monster on which they rest. Probably the surface of the delta was formerly high enough to cover completely the large boulder above which the others were laid down. As the delta was worn away, the latter were left resting on the former. That water could transport and smooth a boulder of such enormous size seems incredible, but the stone is there at a considerable distance from its point of origin, and must have been carried down the slope to its present position by floods.†

A mile below this we stopped at the head of the biggest rapid yet seen, and of course the men wanted to make a portage. As our time was growing short, and a portage would take nearly a day, we decided to leave the light baggage for the men to carry over the quarter-mile chord of the great boulder-strewn fan which caused the rapid, and ourselves take the raft down. They expected that we should be drowned, and they would be left alone without a kellek in the bottom of that almost inaccessible gorge; but in spite of their entreaties we pushed off, and although we paddled hard were in the rapid before we had reached mid-stream. There was a long swift exhilarating shoot over a tilting stretch of water, and we were among dashing waves which seemed to be 10 feet high. As the kellek rose on the first one, we stopped paddling and seized the ropes. We whirled round and round more swiftly than ever before, this time not looking at the grandeur of the mountains, but only at the waves, which broke over us again and again, wetting us to the skin. The kellek stood the passage perfectly, and below the rapids we brought it safely ashore. When at last the men overtook us, they seemed to feel that our preservation was miraculous.

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* See Davis, W. M., "An Excursion to the Grand Cañon of the Colorado," *Bulletin* of the Museum of Comp. Zoology at Harvard College, vol. xxxviii. (Cambridge, 1901) p. 169.

† See Gilbert, G. K., *op. cit.*, p. 71.

LOOKING UP-STREAM IN THE CAÑON OF THE EUPHRATES AT MORFA, JUST SOUTH OF THE GERGER RIDGE.

" You're not men; you're jinner (spirits) ! " one of them exclaimed.

From here to Chunkush the gorge is cut almost entirely through limestone. Travelling at the rate of 8 miles an hour, we passed for 18 miles through a continuous succession of bed-rock rapids, many of them larger than those around which we had made portages. We spent the night on a tiny ledge, where the precipice overhung us and partly protected us from the light rain that fell toward morning. Although neither the river, the mountains, nor the Kurds had harmed us, the men seemed determined to find something of which to be afraid.

"If we sleep here, the bears will come to the top of the precipice and throw stones on us," they said, when we proposed to land on the narrow ledge.

The next to the worst rapid is 2 miles above Chunkush, where the one of our kellekjis whose sleep had been disturbed by dreams was washed overboard by the waves. Most fortunately his companion seized his arm, and we all pulled him on to the raft at the imminent risk of upsetting it. A few minutes later, while we were still in the same long rapid, we encountered one of the dangers that we had most feared. The raft stuck on a hidden rock in such a position that the waves would soon have battered the skins till they leaked and the raft went to pieces; but we got off by shifting the load first to one side and then the other, thus, as it were, prying the raft over the stone.

From Chunkush to Gerger, where our river journey ended, the mountains grew gradually lower. The river presents no special obstacles and no points of marked interest, although the scenery is still fine. The large Chermug Chai, a brook which enters on the left, has two main branches: one, the Kizilchabuk, is a wet-weather stream from the south-east, where it drains part of the plain north-west of Diarbekir; the other has always a large stream. Its main source is halfway between Chunkush and Chermug, where there is in the limestone a great sink-hole over 400 feet deep, with an aperture scarcely 50 feet by 20. The water from this reaches the surface 2½ miles farther east, near the village of Sinek, from which the stream takes its name. A smaller branch comes from the locally famous sulphur hot springs of Chermug.

At Gerger, where the Euphrates passes through the last outlying ridge of the Taurus mountains, we find one of the narrowest gorges. The hard limestone mountains rise over 2000 feet above the river, the north side of the ridge being bounded by a long line of cliffs 400 or 500 feet high, from the base of which there is a much more gentle slope to Petterge Chai. The south side slopes off gradually in well-rounded gentle hills which can be traversed with great difficulty because of the rough pits and sharp edges into which the limestone weathers, and which have been denuded of soil because of the deforesting which has taken place. As one stands on the top of the ridge, a long broad depression is here visible—the old valley of the Euphrates stretching to the south-west nearly parallel to the mountains—but there is no sign of the river, whose present course is marked only by a slight line of cliffs. An observer who did not know that the river intervened would think that he could easily walk to the hills on the opposite side. The river now flows in a narrow cañon with perpendicular walls 450 feet high.

This journey of 190 miles by water from Akhor to Gerger occupied seven days, including the unnecessary portages, although the time actually required for floating down the river was only thirty-seven hours. The 50 miles from Akhor to the Kara Su occupied ten hours, the 35 miles to the beginning of the Malatia Plain six hours, the 45 miles to Kemur Khan ten and a half hours, and the remaining 60 miles to Gerger ten and a half hours. The total descent as measured by aneroid is 1250 feet, the steepest part being near the big rapid just below Tilek, 100 feet in 6 miles, and the gentlest descent being in the Malatia plain, 100 feet in 55 miles. We found that the map as given by Von Moltke needs considerable correction.

At present the roads avoid the gorges of the river and climb over the high mountains. As soon as railroads are introduced, there can be no doubt but that, as usual, one of the main lines will follow the easy grade of the river.

Although the utilization of the Euphrates river for industrial purposes may be far in the future, it is, nevertheless, a problem which will some day be of great importance. The most valuable part of the river's basin is Mesopotamia, which begins south of our journey's limit, and of which I cannot speak from personal knowledge. A comparison of the accounts of ancient and modern travellers shows, however, that its present poverty is almost as remarkable as was its ancient fertility and wealth. That region is described as being so rapidly and completely ruined by the invasion of the sand of the desert on the south-west side, and by the constant shifting of the channel of the Euphrates river in the centre, that the future will be even more desolate than the present unless measures are taken to resist these encroachments. Against both the river and the desert the means of protection lies in controlling the river itself. In ancient times the control of the water was effected by a great system of canals, embankments, and reservoirs in Lower Mesopotamia. These were in constant need of expensive repairs, and their breaking was the cause of frequent disaster. England has found that the only way to control the Nile is to control its sources, and, having finished the work of cutting the sudd, she is now making the huge dam at Assuan, and considering the far greater task of regulating the outflow of the great African lakes. It is a work of great magnitude, involving an immense outlay of capital, but there is no doubt that it will prove permanently successful. The problem presented by the Nile is similar to that presented by the Euphrates, and the two must be similarly dealt with, although there is one important difference. In the former case, the chief problem is to conduct the water to the sea by the right channels, in the right quantities, and at the right time. In the Euphrates river, the problem is to use the water before it reaches the sea.

When the Euphrates river is properly controlled, it will serve two great uses: it will be a great producer of power, and it will accomplish the vastly more important work of irrigating Mesopotamia. More than three-fourths of the rainfall of the upper Euphrates basin falls in the seven months from October to April. If the precipitation of this period could be retained among the mountains, and allowed to escape during the late spring and summer, it would not only save Mesopotamia from the annual floods which carry away great sections of land along the banks and convert other large areas into disease-germinating swamps, but would also accomplish the far more important result of enabling vast tracts of the best kind of land to be irrigated and reclaimed from the desert. The extent of the entire region that can be reclaimed by means of the river seems to be as great as that of England. Although Mesopotamia can produce two crops a year, its population is scarcely a million; yet it might support ten times as many people, and still export in great quantities all sorts of food-stuffs. It is destined to be one of the richest parts of the world if its development is unhindered. The great need, so far as merely physical matters are concerned, is the controlling of the Euphrates river.

The best means of accomplishing this seems to be by building reservoirs in the great depression of the upper Euphrates valley between the Taurus and anti-Taurus ranges. This contains a series of small parallel mountain ridges enclosing many plains, generally, although on slight ground, called lake-basins. In the middle of each is a stream, which passes out at the lower end through a steep narrow valley. The plains can easily be converted into reservoirs by the construction of simple dams. The expense, which would not be excessive, would certainly be met, in part at least, by the water-power thus rendered available, while the storing of the surplus water of the winter would be of incalculable value in irrigating Mesopotamia. Of course, the value of the land covered by the reservoirs must be considered. Fortunately it is slight, for although the larger plains are very valuable, the smaller ones are often so cut up by small watercourses that they have little value for agriculture, and might readily be converted into lakes. It is the work of the engineer to determine the best sites for dams, but the possibility of building them seems patent to any one who has seen the plains and gorges. The progress of civilization will necessitate the building of such reservoirs, and the only place where they can be profitably built is north of the Taurus mountains.

What has been said of the Euphrates river is, with certain modifications, true of the Tigris also. Reservoirs can probably be built east of or among the Zagros mountains, just as they certainly can be built north of the Taurus mountains. From the earliest times until now the history of the Mesopotamian plain has been sharply separated from that of the mountains to the north and north-east. In the future the history of the two regions must be one, because the development of Mesopotamia depends absolutely on the great rivers which flow from the mountains, and must there be controlled.

REPORT ON THE IDENTIFICATION OF THE BAY OF SAN FELIPE AND SANTIAGO VISITED BY QUIROS IN 1606.*

THE material for the voyage of Quiros and Torres from Lima across the Pacific in 1606 is enumerated in an appendix, with a table of the different islands discovered, and the latitudes recorded.

The hypothesis that the bay of San Felipe and Santiago of Quiros can be identified with Port Curtis, or any other bay on the Australian coast, is entirely incompatible with the accounts of the voyage. Putting on one side for the moment the disagreement of the descriptions given both of the land and natives, it would be necessary to assume, not only that the latitude of Espiritu Santo was falsified, but that every latitude, every course steered, and every detail given of the whole voyage was also falsified. This would not only be an astounding assumption, as the various accounts agree very nearly with one another in all important details, with just as much difference as affords evidence of independence and truth, but would make it hopeless to attempt to identify anything; whereas, by following the descriptions given by the two sailors, leaders of the expedition, every island seen or visited can be perfectly and satisfactorily determined.

Making the usual allowance for exaggerated description and imperfect examination by explorers who naturally wished to make the most of their discoveries, nearly every detail fits in; and probably no identification of an early voyage is more complete than that of the bay of San Felipe and Santiago with the bay now so named in the island of Espiritu Santo in the New Hebrides.

The general facts as to the courses steered and distances supposed to be run are given in the appendix, but it is the latter part of the voyage that it is desirable to deal with in detail, to show what the evidence is for the received view of the position of Espiritu Santo.

On February 21, 1606, sixty-two days after leaving Lima, the ships were in or about the parallel 10° 30′ S. lat., which they were running along as nearly as possible with the avowed intention of making the Island of Santa Cruz, visited by Quiros with Mendaña in 1595, and ascertained to be in that latitude. On March 2 they touched at a low inhabited island which they called Gente Hermosa. This is probably the island so called on the charts, in 11° S. and 171° 3′ W.

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* This is the report of a special committee appointed by the Council of the Royal Geographical Society, at the request of the Melbourne branch of the Royal Australasian Geographical Society, to consider a proposition recently advanced that the bay of S. Felipé and Santiago, visited and so named by Quiros, was the bay of Port Curtis in Queensland: the committee consisted of Sir Clements R. Markham, K.C.B., President R.G.S.; Admiral Sir W. J. L. Wharton, K.C.B., Hydrographer to the Admiralty; Admiral Sir Richard E. Tracey, K.C.B.; and William Foster, Esq., late Secretary to the Hakluyt Society.

On April 7 they sighted a high black island, one of a group, in about 10° S., being then by their reckoning 1940 leagues from Lima. They give its name as Taumaco, and it is no doubt the highest of the Duff islands, which lie in this latitude (see beyond). Here they remained for twelve days, and obtained from the natives information of many large islands to the south. One of these was called Manicolo.

Now Mallicolo is one of the larger of the New Hebrides, and lies 360 miles south of Duff islands. Captain Cook gives Manicolo as one form of the name. But it is also possible that Vanikoro, which is a large island compared to the Duff islands, and is only 80 miles distant, may be the Manicolo of the Taumaco islanders, because the French explorer, D'Urville, in 1828, understood Manicolo to be the form of the name given to him at Tucopia as that of the island on which the ships of La Perouse had been lost.

Torquemada describes at Taumaco what he calls a fort, and says it is a small island situated inside the reefs, made by hand of live rocks, on which were about sixty houses. Such an island, with a coral-rock wall round it, with houses and coconuts, exists to this day at the largest of the Duff islands, and forms a very remarkable item of identification.

Sailing from Taumaco on April 16 or 19, and steering S.S.E. in search of the large islands described to them, the expedition sighted on the 21st a small island called Tucopia, in 12° or 12° 30′ S. This was high and inhabited, and can be absolutely identified with the island named Tucopia at present, which lies 150 miles S.E. by S. from the Duff islands, is about 1300 feet high, and is in 12° 15′ S. This island was known on the charts for some years as Barwell island, the ship *Barwell* having sighted and reported it in 1798. But in 1813 a German named Martin Bushart was left on it by the *Hunter*, and lived there until 1826, when Captain Dillon, who had been in the *Hunter*, called again at the island, and found him there still. Dillon learnt from him that the natives called the island Tucopia. Bushart had seen articles of European make, which gave Dillon the first clue to the fate of La Perouse.

In 1828 Captain Dumont D'Urville visited this island for news of La Perouse, and calls it Tikopia, which was his idea of the native pronunciation. Captain D'Urville relates that he obtained from the natives through the interpretation of Bushart, who spoke their language perfectly, the names of islands around, and that one of them was called Taumako, and lay to the north-west. These two islands may thus be considered as absolutely identified, though the name Taumaco does not yet appear on the charts, because the Duff islands have never yet been properly examined, and it is not known to which of them the name applies.

From Tucopia Quiros sailed south to lat. 14° S. and then west, and a day or two later, on April 25, discovered a high island with a volcano, about 3 miles in diameter, in 14° 30′ S. They called it Nuestra Señora de la Luz, and found it to be inhabited. This is certainly Merelav of the Banks group, which lies in 14° 25′ S. and answers the description, for though not now in activity there is a crater on the summit.

When off this volcano they saw other high islands, west, south-west, and south-east. This answers to the locality. Gaua of the Banks group was to the west, Santo and Aurora of the New Hebrides group to the south-west and south-east respectively, all mountainous and in sight.

After visiting Gaua, which they called Santa Maria, they steered for the large land to the south, and arrived on May 1 at a bay in it, to which they gave the name of S. Felipe and Santiago. The latitude of its head is given by Quiros as 15° 20′ S., and by Torres as 15° 40′ S.

The large bay at the north end of Santo has only been imperfectly explored, but sufficient is known of it to make certain that it was the bay visited by Quiros. The most salient features are its size (10 miles wide, 15 the length of one side, and 30 of the other) and great depth, and the freedom from rocks, shoals, or other impediments to navigation. When the two ships left it, it is related that, finding the wind strong, they endeavoured to return to the port of Vera Cruz at its head, and that for three days they worked to windward with this intention. It is especially mentioned that they could find no anchorage elsewhere, and, finally, Quiros was blown out of the bay and the ships parted, for Torres had reached the head of the bay again.

Captain Cook, in 1774, vainly tried to find anchorage when drifting in the bay and in danger of being set on shore, and found the water very deep right up to the steep shore. The prevailing direction of the wind in June, when Quiros was there, is strong from the south-east or out of this bay, and it can be safely stated that there is no other bay in this part of the Pacific, including the whole eastern coast of Australia, in which these circumstances could have occurred. The axis of the bay is stated to be north and south.

The bay of Port Curtis is not only so narrow that no ships could have acted in this manner, but it is everywhere of moderate depth, is much encumbered with rocks and shoals, and the sea outside is for miles of such small depth that a ship can anchor anywhere. Moreover, the trade wind which prevails in June blows right up Port Curtis, which lies W.N.W. and E.S.E., and the difficulty is not to get into it, but to get out. Of all sheets of water on the Pacific shores it answers least to the description of the bay of S. Felipe and Santiago.

More than this, most important direct evidence, in favour of the bay in Santo, exists in the map of it, drawn by Don Diego de Prado y Tovar, —who was chief pilot or captain with Quiros, but left his ship for that of Torres at Taumaco—and which is still in the archives at Simancas, where it was unearthed in 1876. It was published in facsimile in the *Boletin* of the Geographical Society of Madrid in 1878 (vol. iv. p. 92), and is also reproduced in Mr. Collingridge's 'Discovery of Australia.' The shape of the bay is precisely that of the bay at the north end of Santo, and the latitude of its head is given as 15° 20′. Captain Cook determined it as 15° 15′. No one who looks at this chart could for a moment imagine that it could be Port Curtis.

It is scarcely necessary to refer to the description of natives, weapons, dwellings, produce, vegetation, none of which can refer to the Australian coast, while they all agree with what is known of the New Hebrides. The marble spoken of is easily accounted for by the cliffs of upraised white coral which are a common feature in all the New Hebrides, and which an ardent imagination might easily mistake for marble.

Torres, when he left the bay of San Felipe, did so with the intention of sailing round the island, as he calls it, and actually did sail down the west side, being continually forced by the trade winds away from it, and so down an open sea to 21° S. As Port Curtis is on the eastern coast of Australia, this would be impossible. Moreover, when he turned north he could not have made the east point of New Guinea as he describes, and which he tried to pass to the eastward, had he sailed south from Port Curtis; nor could Quiros have made his clear course to the northward on his way back to America had he started from Port Curtis.

It may, perhaps, be added that off the coast of Australia there are no such islands as those described as Taumaco, Tucopia, Nuestra Señora de la Luz, Santa Maria, and the other islands seen southward from Nuestra Señora de la Luz. All the islands north and east of Port Curtis for many miles are small, low sandy islands, with no inhabitants; neither is there any volcano nearer to Port Curtis than those in the New Hebrides and Banks groups.

APPENDIX.

NOTE ON THE AUTHORITIES FOR THE VOYAGE OF QUIROS.

1. The fullest narrative of the voyage of Quiros is in a work called the 'Monarquia Indiana,' by Fray Juan de Torquemada (lib. v., caps. 64 to 69, pages 738 to 756 of vol. i.). This work was published at Seville, 1615, the licences and approbations being dated 1612 and 1613. The first edition is very scarce. The second edition, in 3 vols., was published at Madrid in 1723. Torquemada was a Franciscan Friar living at Mexico when Quiros and his crew arrived after the voyage. In one of his 'Memorials' Quiros says that he left an information of his discoveries witnessed by ten of his crew (see Dalrymple, i. p. 145). Burney, therefore, looks upon the account in the 'Monarquia Indiana' as given on the authority of Quiros. Dalrymple and Burney use it largely, but it has never before been translated.

2. Quiros, on his return to Spain, presented eight 'Memorials' to Philip III. relative to his being employed again to settle his so-called "Australia." They consist mainly of exaggerated accounts of his discovery. The first 'Memorial' was published at Seville, and is given by Purchas (iv. p. 1427). The eighth is also given by Purchas in translation. Dalrymple gives them both in English (i. p. 145 and 162). The first gives a list of the names of islands discovered, but very little else that is not in Torquemada.

3. Quiros wrote an account of his life, including his voyage with Mendaña to the Marquesas and Santa Cruz, and his own voyage, with several royal decrees, memorials, and other documents. It has been published in vol. v. of the 'Coleccion de Documentos Ineditos' (Madrid).

4. Friar Diego de Cordova y Salinas, a Franciscan, wrote 'Historia de la Religion Seraphica,' which was printed at Lima in 1630; second edition, Madrid, 1643. Both editions are excessively scarce. In this work there is a brief account of the voyage of Quiros, copied from Torquemada.

5. Fray Antonio Daza wrote a 'Cronica General de la orden da San Francisco,' and in his fourth part he gives the text of the 'Auto de Posesion,' drawn up by Quiros when he took possession of his island "Australia del Espiritu Santo." It gives the latitude.

6. Dr. Juan Luis Arias addressed a 'Memorial' to King Philip III. on the extension of the Church by the conversion of the infidels reported by Quiros. He was not in the expedition, but he had access to original documents, for he gives three important latitudes—of Taumaco, of Espiritu Santo, and of the furthest south of Torres. The 'Memorial' of Arias is given by Major in his 'Early Voyages to Terra Australis.'

7. Luis Vaez de Torres was the second in command under Quiros. He wrote a brief but very important 'Report' on the voyage, to Philip III., from Manilla, dated July 12, 1607. The original is mentioned by Navarrete as being at Simancas. There is a manuscript copy in the Biblioteca Nacional de Madrid (j. 2). Dalrymple obtained a copy, and made a translation, which he allowed Burney to publish in the appendix to his second volume. Major reprinted it in his 'Early Voyages to Australia' (Hakluyt Society, 1859). Lord Stanley of Alderley translated the manuscript copy at Madrid, and gave it as appendix vi. in his 'Philippine Islands' (Hakluyt Society, 1868). The letter is also reprinted in Collingridge's 'Discovery of Australia' (Sydney, 1895), p. 229. Torres gives twelve latitudes, but he is bad as regards dates, being supplemented in that respect by Torquemada.

8. Gaspar Gonzales de Leza, pilot in the ship of Quiros, wrote a narrative of great importance, which is in manuscript at the Madrid Library (j. 2). Lord Stanley gives several translated extracts from it, as explanatory notes to the 'Report' of Torres.

9. Diego de Prado y Tovar called himself captain of the *Capitana*, but he left Quiros to join Torres at Taumaco. Copies of two of his letters are in the Madrid Library (j. 2). A translation of one is given by Lord Stanley (p. 142 n.). The originals are at Simancas, and are printed in the 'Coleccion de Documentos Ineditos' (t. v.). They are reprinted by Collingridge (p. 246). Prado also drew four coloured maps, one of the bay of San Felipe y Santiago, and three of bays in New Guinea. On the first map he gives the latitude of the bay of San Felipe and Santiago. The originals are at Simancas, but they were reproduced in the *Boletin de la Sociedad Geografica de Madrid* (January, 1878), iv.: also reproduced by Collingridge without colour. Prado speaks of Quiros with contumely, calling him a liar and a madman. "A low and lying man who yesterday was a clerk in a merchant ship, and a Portuguese." Antonio, the bibliographer, also called him a Portuguese, said to be a native of Evora. It is a Spanish name.

10. Juan de Iturbe, the accountant on board the ship of Quiros, wrote a report of the voyage, dated at Mexico, March 25, 1607. It is in the Madrid Library (j. 2). Lord Stanley gives extracts from Iturbe as notes to the 'Report' of Torres.

Dalrymple, in his 'Historical Collection of Voyages in the Pacific' (1770, vol. i.), gives an account of the voyage of Quiros, chiefly from Torquemada (pp. 95–144), and he also printed the two 'Memorials' of Quiros.

VOYAGE OF QUIROS, 1606. TABLE OF COURSES AND LATITUDES.

Dates given by Quiros.	Courses.			Latitudes.				Longitudes.	Burney's deductions.	Islands.	Names.		Variation.
	Leza.	Quiros.	Torres.	Torres.	Quiros.	Leza.	Arias.				Quiros.	Torres.	
1605. Dec. 21 ...	—	W.S.W.	800 leagues W.S.W.	—	—	—	—	—	—	—	—	—	—
„ 25 ...	--	—	„	26° S.	--	--	26° S.	—	—	—	—	—	—
1606. Jan. 26 ...	—	—	W.N.W.	24° 30′ S.	25° S.	21° 45′ S.	—	1000 leagues from Lima	58° 13′ W.	Island 4 leagues round	Encarnacion	Anegada (Leza)	—
„ ...	—	—	W. b. N.	24°	—	—	—	1075 leagues from Lima	—	Island 12 leagues round	San Juan Bautista	San Valerio	—
Feb. 2 ...	-	—	W.N.W.	21° 20′ S.	—	—	—	—	—	Large island, lag on in centre	Santelmo	"Isleta rasa"	—
„ 4 ...	—	—	N.W.	19°	—	20° S.	—	—	—	Four coral isles	Los 4 Coronados	Las Virgenes	North-easterly
„ 5 ...	—		—	—	18° 40′ S.	—	-	—	—	—	San Miguel Arcangel, Conversion de S. Pablo	—	—
„ 9 ...		—	W.N.W.		—	19° S.	—	—	—	Island to N.E.	La Dezena	Santa Polonia	—
„ 10 ...	—	—	—	18° 30′ S. S.E. point	—	1°	—	—	—	Inhabited island	Sagittaria (Anaa)	—	—
„ 11 ...		—	—	—	17° 40′ S., N.W. pt.	-	—	—	147° 2′ W.	—	—	—	—
„ 12 ...	—	—	—	—		—	--	—	—	—	—	—	—
„ 13 ...	—	—	—	—	—	16° 15′ S.	—	—	-	Low island	La Fugitiva (Makatea)	—	—
„ 14 ...		—	N.W. b. N.	16° 30′	—	15° S.		1398 leagues from Lima (L)	—	do.		—	1 point easterly
„ 15 ...	—	—	W. b. N.	10° 45′	10° 30′ S.	—	—	—	-	Low islands	Del Peregrino (Matakiva)	—	—
„ 21 ...	—	—	—	—	—	10° 15′ S.	—	—	—	—	—	—	—
„ 22 ...	—	—	—	10° S.	10° 31′ S.	10° 30′ S.	—	—	—	Low inhabited island	Gente Hermosa	Matanza	—
March 2 ... „ 3 ... „ 5 ... „ 22 ...	Mar. 5 to Apr. 9, W. in 10th parallel	—	W.	33 days W., in 10th parallel	—	10° to 10° 30′	--	—	—	—	—	—	—
April 7 ...	—	—	—	—	—	10° 10′ S.	10° S.	1940 leagues from Lima, 60 from Sta. Cruz	169° 45′ E.	High island	Monterey or Toumaco	Taumaco	—
„ 9 ...	--	—	—	—	--	—			—	—	—	N. S. de Loreto (L)	—
Left Taumaco {16* or 19†}	—	—	S.S.E.	12° 30′ S.	full 12°	—	—	—	—	—	Tucopia	Chucupia	—
April 21 ...	--	—	—	—	—	--		—	—	—	N.S. de la Luz	Volcano island	—
„ 22 ...	—	—	S.	—	—	--	—	—	—	—	—	—	—
„ 25 ...	—	—	—	14° 30 S.	14° 30′ S.	--	—	—	—	—	—	Sta Maria	—
„ 27 ...	—	—	—	—	—	--	—	--	—	In sight of La Cruz	—	—	—
„ 30 ...	--	S.W.	S.W.	—	—	—	—	--	—	—	—	—	—
May 1 ...	--	—	—	—	—	--	—	--	—	—	Baia de San Felipe y Santiago, May 1 (L & I)	—	—
„ 2 ...	—	—	—	15° 40′ S.	15° 20′ S.	—	15° 20′ S.	—	—	—		—	—
„ 3 ...	—	—	—	--	--	—	—	—	—	—		—	—
„ 8	—	—	—	—	—	—		--	—	—	Vera Cruz, May 3 (L & I)	—	—
June 11	—	—	—	—	—	—	—	—	—	—		—	—
Quiros separated from Torres.	—	—	—	—	--		—	—	—	—	—	—	—
June 28 Torres sailed	--	—	S.W., N.W. and N.N.W.		—	—	to 21° S.	—	—	—	—	—	—

Burney, in his 'History of Voyages in the South Sea' (vol. ii.), gives a more complete account of the voyage of Quiros based on Torquemada and the 'Report' of Torres. He traces the route with great care, and with the skilled hand of an expert (pp. 268–327). He also gives a map with the route.

REMARKS ON THE RELIABILITY OF THE POSITIONS GIVEN IN THE VARIOUS ACCOUNTS OF THE VOYAGE OF QUIROS.

It has been suggested that the latitudes given for the voyage of Quiros were falsified to deceive the English, as was the custom with Spaniards. It was not the custom in books published by authority, and all books were so published. The latitudes given in narratives of Spanish voyages are, as a rule, more accurate than those given by English seamen.

In the case of Quiros, the circumstances render such falsification impossible. Independent observations, differing slightly from each other, were taken in the two ships of Quiros and Torres. They parted company suddenly and unexpectedly. Torres wrote his 'Report' from Manilla, and gave courses and twelve latitudes. At about the same time, Quiros (in Torquemada) wrote his statement at Mexico, giving dates, courses, and eight latitudes. Torres supplies Burney with the materials for calculating two longitudes. Arias gives three latitudes, and there is another in the 'Auto de Posesion.'

These observations of different observers agree quite near enough to show the approximate route, but differ sufficiently to prove that they were taken independently.

NOTE ON THE IDENTIFICATION OF LA SAGITTARIA OF QUIROS.

By Rear-Admiral Sir W. J. L. WHARTON, K.C.B., F.R.S.

IN the accounts of the voyage of Quiros and Torres in 1606, it is related that, on February 10 and 11, the Expedition touched and landed on an island called, by Quiros, La Sagittaria, the southern end lying in lat. 18° 10′ S. or 18° 30′ S., the northern in 17° 40′ S., and on which they saw many inhabitants.

La Sagittaria has been generally supposed to be Tahiti, but I think that this is a mistake. The only word of description is from Torres, who calls it a low island. Now, Tahiti is entirely mountainous, rising to over 7000 feet. It is impossible to believe that the slopes of the hills would not be visible, even if the peaks were covered; and men sailing, as they had done for fifty days, looking for new lands, would have gone into ecstasies over the beautiful prospect afforded by this lovely island.

The landing is minutely described by Torquemada, a translation of whose account, by Sir C. Markham, I have had the advantage of reading, and is an excellent account of the difficulties of landing on the foreshore of a low reef island, on which the swell beats and breaks, and boats can only back in to allow men to jump overboard, and struggle to the shallow reef edge, with great chance of being overwhelmed by the successive waves, just as is here related.

Now, Tahiti is nearly entirely surrounded by a narrow barrier reef, through which are numerous openings to the smooth, comparatively narrow lagoon within. No one would attempt to land on this barrier, but would pass through an opening, and land on the quiet beach within. Where there is no barrier reef, the sea beats furiously against perpendicular cliffs.

One of the great desires of the voyagers was water, for which, after landing, they searched. At Tahiti there are numerous streams, and they could be seen from the ships.

The island which the expedition struck appears to me to be probably Anaa, or Chain Island, a southern outlier of the great Tuamotu or Paumotu or Low group. This is a long low atoll, about 20 miles in length, the rim of the lagoon being dotted with an almost continuous chain of islands. It lies between 17° 30' and 17° 20', which is quite near enough for the determination of latitude which, with the awkward instruments of those days, they were enabled to make from the deck of a ship in motion. Anaa is 200 miles east of Tahiti, a longitude which suits the meagre reckoning of the expedition just as well as Tahiti itself.

It is related that when they landed they passed through a thick wood, and came to the "other bay of still water which is on the other side of the island." This has been supposed to be the isthmus which joins the two high parts of Tahiti, but it answers better to the low islands of an atoll, the still water they reached being the lagoon. The Tahiti Isthmus is 1½ miles across, and the mountains slope abruptly to it on one side and more gently on the other. It is 100 feet high. From whichever side approached, this isthmus lies at the bottom of wide deep bays. These bays are guarded by coral reefs barely covered, on which it is impossible to land. These reefs passed, on the north side a deep lagoon a mile wide, in which lies a picturesque wooded islet, is crossed to the beach; on the south side is a long and intricate harbour, Port Phaeton, at the head of which is the isthmus.

It is impossible to think that this is the place crossed by Quiros' men. It is, moreover, especially stated that "the sea is joined to that other sea on the other side of the island when it is high tide by a shallow and sandy channel between the two clumps of trees." There is nothing to answer to this in Tahiti, whereas there are numerous passages of this description in a lagoon island like Anaa.

On leaving Sagittaria, another low island was seen three days later, in 16° 15'. Steering to the W.N.W. before the trade wind, there is no such island if they had left Tahiti, Tetarva, the only low island near Tahiti, being not more than 20 miles from it. Moreover, as this island was north of them, they must, in their further course, have sighted the lofty leeward islands of the Society group, which would lie near their track.

Again, they sighted another low island next day. There is no such island, if Sagittaria is Tahiti.

But if they left Anaa, Makatea, in 16° S., answers to the first island, and Matahiva, in 15° S., to the second.

It may be mentioned that Anaa has always been one of the most thickly inhabited of the Low islands. Not many years ago it contained about 5000 inhabitants, and was the French seat of Government; but a disastrous hurricane, in 1879, created great destruction of both life and property.

If Anaa be Sagittaria, it follows that the various islands seen during the days immediately preceding the visit to the latter are not those which have been generally identified with them. But no difficulty is introduced, beyond the difficulty of picking out which of the numerous low atolls which exist eastward of Anaa are those which were sighted. In this probably no two investigators would precisely agree.

THE NATIONAL ANTARCTIC EXPEDITION.

The Departure of the "Morning."

On Wednesday, July 9, the steam yacht *Morning* sailed from the Thames *en route* for New Zealand, whence, after refitting and taking in stores, she will set out in search of the *Discovery*. The object of sending out the *Morning*, and the course to be pursued by her commander, will be seen from the "Instructions" given below, and from the communication to Captain Scott. The *Morning* has been fitted out entirely on the responsibility of the Royal Geographical Society, and it has been through the persistent efforts of the President, Sir Clements Markham, that the necessary funds have been obtained. Up to date a sum of £23,000 has been subscribed. This apparently large sum is not by any means more than has been actually required for the purchase, reconstruction, and equipment of the *Morning*. After providing for all expenses, including the payment of officers and men for eighteen months, there is a balance of £1800, not too large a margin for contingencies. The ship itself, the *Morgen*—in English the *Morning*—was built specially for strength by the late Svend Foyn, of Tonsberg, in Norway, in 1871, and was thought of as the ship for the main expedition in 1897. Her price was then £6000. After the owner's death her price fell, and in October, 1901, she was bought for £3880. Strong though she was, a ship built thirty years ago, and intended for such hazardous work as battling with the antarctic ice, required to be thoroughly overhauled. This has been done with complete satisfaction by Messrs. Green, of Blackwall, at a cost of over £7000, so that the total cost of the ship, including new boats, new propeller and shaft, cables, steering-gear, spare rudder, ventilation, furniture, cold-storage room, and other things, is probably not less than £11,000. The testing of the ship for stability and the introduction of ballast-tanks alone cost £500. Very serious repairs had to be made to the engine. Then, of course, there has been a large expenditure on carpenter's, boatswain's, and engineer's stores, furniture, provisions, clothing, sledges, ice-saws, and new sails, besides scientific instruments and photographic gear. The wages alone for eighteen months amount to £4371. But the ship is now so strong and well equipped that she is prepared to face anything. Her length is 140 feet, breadth 31½ feet, and depth 16½ feet. Her gross tonnage is 437, and her registered tonnage 297. Besides the coals required for the *Morning* herself, she will be able to take out 200 tons for the *Discovery*, together with ample supplies of such articles as will be most required by the explorers. A freezing-chamber has been built on deck, capable

THE *MORNING.*

of taking 100 carcases of sheep in ice, and these it is expected will be supplied in New Zealand without charge. The *Morning* altogether can carry 318 tons of coal besides her deck load, and 107 tons of provisions. She is barque-rigged, has a good auxiliary engine and two boilers, and can steam 8 knots. Her light draught is 15½ feet after and 12 feet forward; loaded, 19 feet after and 17 feet forward. Of course, she had to be thoroughly gutted of her old whaling arrangements, and her whole interior was reconstructed for the special purpose for which she has been bought. She has a fairly spacious ward-room and comfortable cabins for the officers, while roomy quarters have been arranged for the men, and, as the cooking galley is in close proximity, they are likely to be warm enough amid the cold surroundings of the far south.

LIEUT. WILLIAM COLBECK, R.N.R., COMMANDER OF THE *MORNING*.

While the main object of the *Morning* is, of course, to act as tender to the *Discovery*, still she is well equipped with scientific instruments of various kinds, some of which have been supplied by the Admiralty, including excellent survey instruments, a large photographic equipment, sounding gear, and apparatus for collecting at least the surface fauna of the ocean. Constant meteorological observations will be taken, and in other respects as far as possible the staff on board the *Morning* will do its best to supplement the work of the *Discovery*. The captain of the *Morning* and commander of the relief expedition is Mr. William Colbeck, a sub-lieutenant in the Royal Naval Reserve, who has had a thorough training in seamanship, has been first officer on board the Wilson liner *Montebello*, and was one of the staff of the Southern Cross Antarctic Expedition, on which he took the observations and drew the charts. Captain Colbeck is thirty-one years of age, and has the entire confidence of those responsible for the expedition. His first officer is Rupert England, aged twenty-six, also an officer in the Wilson Line. The other officers are Edward R. J. Evans, sub-lieut. R.N., of his Majesty's ship *Majestic*, aged twenty-one; Gerald S. Doorly, aged twenty-two, midshipman R.N.R., of the P. and O. steamship *Nubia;* George F. A. Mulock, aged twenty, sub-lieut. R.N., of his Majesty's ship *Triton*. The engineer is J. S. Morrison, aged twenty-nine; the surgeon, George Adam Davidson, who has had several years' practical experience; while there are two youngsters rated as midshipmen, F. L. Maitland-Somerville and Neville Pepper, both prepared to do the work of seamen. The crew consists of eight petty officers, nine seamen, and three firemen. A very large proportion of these have been with Captain Colbeck in the *Montebello*, so that he is thoroughly familiar with their qualifications and character. There will thus be twenty-nine all told on board the *Morning*, every one prepared to turn his hand to any work likely to promote the objects of the Expedition.

The following are the instructions to the commander of the *Morning*:—

1. The President and Council of the Royal Geographical Society have fitted out the wooden ship *Morning* to take out coals and provisions and such assistance as she may require to the *Discovery*, now wintering in the Antarctic Regions, and have entrusted you with the command. As soon as you are able to communicate with the *Discovery*, you are to place yourself under the orders of the officer in command of the Expedition.

2. You have superintended the refitting and provisioning of the *Morning* since last February, and you have been consulted and your wishes have been attended to on all that relates to the complement of the ship's company and to the appointments of officers and men. You will, therefore, start on your voyage well equipped in all respects for the performance of the important service which has been entrusted to you.

3. You are to leave England not later than the second week in July, and, after filling up with coals at Madeira, to proceed to Lyttelton, New Zealand. At Lyttelton you are to refit, make good defects, and fill up with coals and provisions; taking on board special supplies of flour and biscuit, golden syrup, and preserved meat. The President and Council attach great importance to the provision of as large a supply as possible of fresh meat and butter for the *Discovery's* people, and a special ice-house has been built on the upper deck. You are to see that it is well stocked, and that care is taken as regards its management.

4. You are also to give close attention to the dietary, health, and comfort of your own officers and crew.

5. You are to proceed from Lyttelton to the ice in December; and your previous experience of the antarctic pack will enable you to decide upon the best time for entering the ice, and on the meridian which offers the best hope of a speedy passage. On reaching open water to the south, you are to proceed at once to Cape Adare.

6. Copies of a letter from Captain Scott to the Presidents dated December 17, 1901, with an enclosed note by Mr. Bernacchi, and of a despatch from the Presidents to Captain Scott which will be sent out in the *Morning*, are herewith enclosed for your information and guidance.

7. You will see, from Captain Scott's letter, that it is his intention to leave records at Cape Adare, Possession island, Coulman island, Wood bay, Franklin island, and Cape Crozier. You will, therefore, search all these places, or such as you are able to reach, for records, your searches being guided by the information respecting the exact localities where the records are to be deposited, contained in Mr. Bernacchi's note.

8. You are also to examine the coast from Cape Adare to Cape Crozier with great care, to find the *Discovery* in the event of her having wintered anywhere between those points.

9. In the event of finding the *Discovery* anywhere on the east coast of Victoria Land, you should use your best endeavours to communicate, to assist in extricating her from her winter quarters, and to transfer the coals and provisions. You will then proceed as directed by Captain Scott.

10. If you are satisfied that the *Discovery* has not wintered on the east coast of Victoria Land, you are to proceed eastward along the ice-barrier to the place where you landed in February, 1900. Here it is the intention of Captain Scott to endeavour to leave a record on the ice.

11. The absence of the *Discovery* from any part of the east coast of Victoria Land will no doubt lead you to the conclusion that she has succeeded in penetrating into the unknown region to the eastward of the 164th W. meridian.

12. In that case you are not, under any circumstances, to follow her. But, in compliance with Captain Scott's wishes, you are to endeavour to form a depôt consisting of two months' provisions at Cape Crozier, a large depôt of coals and provisions in Wood bay, and a depôt of two months' provisions at Cape Adare. You are not to risk detention in the ice, but you are to make the best of your way to Lyttelton while it is possible, and there await further instructions. You should reach Lyttelton in March or April, 1903.

13. The records left by Captain Scott, which you may succeed in finding, may contain instructions with regard to your procedure, which are not in agreement with those now given to you. In that case you are to obey Captain's Scott's instructions in preference.

14. You will be careful to leave at the places at which you touch records of your proceedings, together with copies of these instructions and of the letter to Captain Scott, for which purpose several spare copies will be supplied to you.

15. The *Morning* is a yacht in the list of the "Royal Corinthian Yacht Club," and is registered under the Merchant Shipping Act, 1894, the Royal Geographical Society being owners. You will see that all on board sign the ship's articles as required by the Act.

16. You are to take every opportunity of acquainting me with your proceedings and your requirements.

17. You have already acquired experience in the navigation of the antarctic seas, and the President and Council have every confidence in your zeal and ability

as a seaman, and that you will carry out these instructions with care and satisfaction. The duty entrusted to you is one of great difficulty and of great importance. You may rely upon the support of the President and Council, and you may assure your officers and crew that the owners of the *Morning* will appreciate their labours, and will watch over their interests while absent on their arduous and difficult service.

(*Signed*) CLEMENTS R. MARKHAM,
President R.G.S.

The following is the "Letter to the Officer Commanding the National Antarctic Expedition":—

1. Our last letter to you was dated October 29, 1901, and we have since received from you your letters of proceedings No. 3 (November 28, 1901), No. 4 (December 22, 1901), and No. 5 (December 24, 1901). We have also received and considered your letter on the subject of the relief ship, and of the instructions her commander should be given, dated December 17, 1901. Your letters to Mr. Longhurst, chiefly relating to the wages and allotments of the men, have all been received and duly attended to; and Mr. Waymouth has sent in an account of the sale of stores left by you at Lyttelton.

2. The magnetic observations and deep-sea sounding reports, and the specific-gravity observations, have been taken charge of by the Hydrographer; and the meteorological observations by the Meteorological Office. The rain-gauge observations were first submitted to Dr. Black, of Edinburgh, in accordance with the wish expressed by Lieut. Royds, and the observations specially taken at the suggestion of Prof. Letts have been forwarded to that gentleman at Belfast. The biological and botanical collections arrived in excellent order, and have been entrusted to the Director of the Natural History Department of the British Museum, together with Dr. Wilson's sketches. The geological specimens were submitted to Mr. Teall, the Director of the Geological Survey.

3. The Trustees of the British Museum have offered to receive all the collections made by the Expedition, to work up the specimens, and to publish the results in a suitable manner, with the funds entrusted to them for such purposes by the Government. The work will be edited by the Director of the Natural History branch of the British Museum, the collectors receiving full credit, and being probably employed as sub-editors. This proposal of the Trustees appeared to be advantageous, and has been accepted by us.

4. From the latest letters received from you we learn, with great pleasure and satisfaction, that you consider the Expedition to have been completely equipped, and that all on board the *Discovery* are animated with that zeal for the service on which they are employed, and that loyalty to yourself as their commander, which can scarcely fail to ensure successful results. We have endeavoured to perform our part by attention to the interests of the members of the Expedition, and by our efforts to comply with the wishes and to forward the views contained in your letter of December 17, with reference to the despatch of a relief ship.

5. You are already aware that a Norwegian wooden ship has been purchased. She has now been refitted at considerable expense, and will commence her voyage to New Zealand early in July, under the command of Mr. William Colbeck, R.N.R., a gentleman with whom you are already acquainted, and who has knowledge of navigation in antarctic waters. The *Morning* is capable of carrying 300 tons of coals, apart from a deck load, 150 or 200 of which would be for the *Discovery*. Besides coals, she can carry about 100 tons of provisions, and she also takes out

some warm clothing for the *Discovery*, especially komagers. Mindful of the wish expressed in your letter of December 17, an insulated freezing-room has been built on the upper deck of the *Morning*, calculated to contain a hundred carcases of sheep, or 6000 lbs. of fresh meat. It is intended to obtain a large proportion of the provisions and coals at Lyttelton, and care has been taken to send out flour, golden syrup, preserved meat, and butter, the kinds of supplies mentioned by you, as per schedule at the end of this letter. The relations of all on board the *Discovery* have been informed respecting the despatch of letters and parcels by the *Morning*. We enclose a copy of the instructions to Captain Colbeck, with detailed list of her officers and crew.

6. Judging from the instructions, and from your intentions so far as they have been made known to us, the most probable event connected with the Expedition is that the *Discovery* will have wintered in Wood bay, or at some other point on the east coast of Victoria Land. Captain Colbeck is instructed to enter the pack in December, or in the first week of January, 1903, and as soon as he reaches open water, to examine the positions enumerated in Mr. Bernacchi's note (which forms an enclosure to your letter of December 17, 1901), in search of records. As soon as he finds the *Discovery* he is to communicate, and to place himself under your orders.

7. You will then be in command of the two ships, and you are to take what you require from the *Morning*, and extricate yourself from your winter quarters with as little loss of time as possible. You are then to do as much exploring and scientific work as the time will admit with the two ships, during the navigable season of 1903. The direction you will take, and the methods you may adopt in performing this service, are left entirely to your own discretion. You will return to Lyttelton in March or April, 1903.

8. An alternative event is that you have succeeded in navigating the *Discovery* far beyond the most eastern point reached by Sir James Ross along the ice-barrier. In that case it is probable that you would make your way eastward, coming out of the ice somewhere in the Ross Quadrant. You advise that, in this event, the *Morning* should not be instructed to follow you. Only in the event of disaster is it likely that your retreating parties would return to Victoria Land. If, therefore, the *Discovery* is not found on the east coast of Victoria Land, Captain Colbeck is instructed, in accordance with the desire expressed in your letter of December 17, to establish depôts containing two months' provisions at Cape Adare, and the same quantity at Cape Crozier, and to leave a large supply of coals and provisions in Wood bay.

9. There are other possible courses that events may have taken which we, in England, can neither foresee nor provide for. Much must, therefore, be left to Captain Colbeck's discretion.

10. We are aware that you were, and probably still will be, very anxious to continue your exploring and scientific work after your return to Lyttelton, during a third navigable season. This would certainly be very desirable if the funds are sufficient.

11. As at present informed, we are of opinion that a third season is not feasible from a financial point of view. But matters may have a different aspect in April, 1903, and we shall be in communication with you on these points when you return to Lyttelton.

12. But, as now advised, we think that the work of the Expedition cannot be prolonged to a third year. As soon, therefore, as the members of the Expedition have been sufficiently rested and refreshed at Lyttelton, you are to proceed to the Falkland islands, taking a series of magnetic and other observations, and deep-sea

soundings across the Pacific, in as high southern latitudes as you can traverse with safety, and thence home.

13. In conclusion, we desire to express our confidence that you and all under your command have zealously and energetically done your best to secure all the objects of the Expedition. His Majesty the King has expressed anxiety to have any news communicated to him that may, from time to time, be received regarding the Expedition. And from His Majesty downwards, all classes in this country have shown the interest they take in the welfare of their antarctic explorers. We all look forward anxiously, but hopefully, for news of your safety.

(*Signed*) William Huggins,
President R.S.
Clements R. Markham,
President R.G.S.

Thus it will be seen that every contingency has been provided for as far as possible, but the circumstances may be such as to call for independent action on the part of Captain Scott or Captain Colbeck, or both. But there is perfect confidence in the intelligence and judgment of both commanders. In his last report Captain Scott more than once asserts that no anxiety need be felt if the *Discovery* is not met with; it will probably mean that the progress of the Expedition has been much more successful than was expected. In that case of course the *Morning* will return to New Zealand, and it is possible that the *Discovery* might come out of the ice independently, perhaps on the American side. If she did not, of course the *Morning* would return to look for her in the following antarctic summer. But for the present we may be satisfied that all has been done that possibly could be done, and we can only wait with patience till the spring of next year, when we may expect to receive news of the Expedition.

THE RUSSIAN POLAR EXPEDITION.

Summary Report for 1901.

By BARON ED. TOLL.

On April 18, 1901, immediately after the Feast of Easter, Lieut. Kolomiezoff and the zoologist, A. Birulja, set out with two sleighs, each with a team of eight dogs, the object of the first being to reach the Yenisei and establish coaling stations, while the second was directed to accompany it as far as Cape Sterlegoff, some 200 versts distant. Two days later began my excursion with Lieut. Koltschak to the Chelyuskin peninsula, accompanied by a sleigh with a team of twelve dogs, and laden as lightly as possible.

On May 1 we reached that point on the bay where we had established a depôt the previous year (1900). The provisions and fish here buried were to complete our supplies, which barely sufficed for just one month. But we were unable to dig out the deposit from the deep snow.

On May 7 we started from this place in an east-north-easterly direction, with the intention of pushing on to St. Thaddaeus bay on the east coast of the Chelyuskin peninsula, and returning thence along the coast. After traversing the tundra for 40 versts in this direction, we again came unexpectedly on an inlet, which grew narrower towards the west-south-west, where it assumed the form of a narrow sound or river-mouth. The position as determined by Lieut. Koltschak on the off side of the bay was 76° 17′ N. and 99° 29′ E.

On May 12 we gave the tired dogs a day's rest at a place fixed by Lieut. Koltschak at 76° 20′ N. and 101° E. Thence I made a day's march, half a degree eastwards, on Canadian snow-shoes. The prospect of any successful hunting was very slight, while our supplies were becoming seriously less, and could no longer hold out for more than eight days. Hence nothing remained but to retrace our steps. Hitherto we had to contend with almost constant difficulties caused by fog and the deep snow already softened by the sun. But henceforth we had to struggle with contrary snow-storms, which lasted almost without a break for fourteen days. The consequence was the loss of five dogs which broke down one after the other through exhaustion. On May 30 we reached the *Sarya*, the excursion having lasted forty-one days. Of these we had to pass nine in the sleeping-sack during the fiercest snow-storms; four were uselessly wasted at the depôt; and during the remaining twenty-eight days we covered 500 versts, the routes surveyed by Lieut. Koltschak being determined by nine astronomical observations. At the *Sarya* I found all the members of the expedition in good health, except Dr. Walter, who was suffering from rheumatism of the joints. But he was otherwise well, and soon regained his full strength.

A. Birulja was back by May 6, after accompanying Lieut. Kolomeizoff as far as Cape Sterlegoff, 75° 29′ N. and 89° 25′ 24″ E. He made an accurate compass survey of the section of the coast traversed.

The day before my return, A. Birulja, together with F. Seeberg, a member of my excursion, had gone off on a trip in the district of the *Sarya*, their objective being a mountain which was 35 versts distant from the winter harbour. As it was the highest point in this coast region, his intention was to place a minimum thermometer on the summit. At the same time Birulja carried out a topographic survey of the intervening tract, while Seeberg made local astronomical determinations and magnetic observations. On June 7 both savants were again on board the *Sarya*.

Meanwhile summer was rapidly drawing nearer. At the end of June was opened the first great crevice in the ice of the *Sarya* roadstead, about 2 versts from the ship. The surface ice which, during the winter, had increased to a thickness of 1·82 meter, grew daily thinner, melting away from the surface downwards. Hence we expected that at the beginning of August the *Sarya* would be released from her winter fetters. But in the interim there was still to be solved a geographical question, namely, to discover the mouth of the Taimyr river.

According to the maps hitherto published, the Taimyr was supposed to discharge in the first or the second of the larger bights lying to the east of the Taimyr sound. Both of these were twice explored by Lieut. Kolomeizoff, and in the first was, in fact, found the mouth of a considerable stream; but its configuration was not at all in accordance with the contour lines given by the topographer Wagenoff on Middendorff's chart. In the second bay no indication could be detected of any river-mouth. As these researches had been undertaken in winter amid fogs and snow-drifts, there still remained a doubt, which could only be removed by fresh investigations carried out in clear summer weather. Should these also lead to negative results, the only remaining assumption would be that the Taimyr discharged into that bight which, during our journey to the interior of the Chelyuskin peninsula, Lieut. Koltschak and I had crossed, since no considerable stream assuredly entered that other inlet where the depôt lay.

The survey of the first two bays was now undertaken by Birulja and Dr. Walter, while I decided to proceed with Seeberg to the farther inlet. As dogs are not available for travelling in this season of the year, there remained only one possible plan, that was for ourselves to take in tow the sleigh, on which a kayak had to be conveyed.

The excursion of Birulja and Dr. Walter lasted from July 20 to August 15, 1901. Respecting the question of the mouth of the Taimyr, the two savants came to negative results. Still, they confirmed Kolomeizoff's discovery of a large estuary in the first of the two bays. Seeberg and I left the *Sarya* on July 18. The bay which formed the objective of our journey was completely free of ice, and after visiting Baer island, which lies in the bay, we were able to certify that this inlet is the mouth of the Taimyr river. On August 24 we were again on board the *Sarya*.

Next day a stiff east wind sprang up; the fissures in the ice of the roadstead expanded; the whole of the ice-pack round about the *Sarya* was set in motion. We drifted first right in the direction of the cliffs of Station island, and then the ice trended to the right clear of the island. We were slowly carried beyond the island, and after six hours the *Sarya* was driven through the Fram strait into the open sea.

During the night we reached the little island at which the previous year further progress had been arrested by a strong ice-barrier. Now, also, the barrier stood firm, and prevented our getting through. We therefore withdrew behind a cape at Nansen island to await the drifting away of the ice-pack. On August 30 the water-way was free, and the *Sarya* began its voyage. On September 1 we doubled Cape Chelyuskin On September 4 we sighted the east coast of the Taimyr peninsula, and then set our course straight for Kotelnoi island.

Without meeting any ice we drew near the New Siberian archipelago in favourable weather till September 7, when a strong south-easter began to blow in our teeth, and against this we made very slow headway. I therefore changed the course to the north-east. On September 9 we reached the edge of the pack-ice in 77° 9′ N. and 140° E. Here we encountered a southern gale, which, acting in concert with the marine current, drove the *Sarya* 30 miles to the north-west. The storm veered round to west-south-west, and I thought it better again to make the most of the wind and now direct our course south-eastwards for Bennett island, instead of trying under these circumstances to penetrate into the ice in search of land. On September 11 the imposing headland of Cape Emma at Bennett island suddenly loomed up before us out of the fog, and presently became again wrapped in fog.

We had approached to within 12 knots of the island, when our further advance towards it was barred by a belt 14 feet thick of impenetrable pack-ice. Here we remained two days in the hope that the ice might shift, but in vain! Yet the engine was in urgent need of repairs; the boiler wanted cleaning, and the pumps putting right. But here no landing was possible, and no option was left but to return. I wanted again to make for the point from which we had been driven by the storm, and accordingly directed the course along the ice-fringe, first westwards, and then north-westwards. In this direction we reached 77° 32′ N. and 142° 17′ E., but had then to yield to the ice bearing down from the north to avoid being closed in. Now I gave orders to steer for Kotelnoi island, and on September 16 we cast anchor in Seal bay, where we were received by K. A. Wollosovich, leader of the rescue expedition. On September 24 the *Sarya* was ready to set sail; but on that day the temperature of the atmosphere was 21·7 F., and of the water 30·2 F., and the drift-ice was forming a continuous crystallization round about the vessel. On this day the second wintering had begun, after a period of thirty days' open navigation.

The station where the hourly observations had begun, on November 1, 1901, was erected under more favourable conditions this year than in the preceding. The accumulations of drift-wood at the bar on which the station stands made it possible to build the necessary structures of wood instead of snow. They moreover yield us such an abundance of fuel that we are all able to keep our living-rooms and the laboratory warm and dry, which will certainly have a favourable influence on the crew, and the same may be said of the now finished Russian vapour-bath. It is further of great importance that we are provided with fresh reindeer meat for the whole winter.

REVIEWS.

AMERICA.

Central America.*

In the *Journal* for February, 1901, a notice appeared of Frau Seler's 'Auf alten Wegen in Mexico and Guatemala,' containing a popular account of Prof. Seler's expedition of 1895–97 to Central America, undertaken at the instance and at the charge of the Duc de Loubat in the interest of archæology and ethnography. In the present volume are embodied the scientific results of a long visit paid on that occasion to the secluded and hitherto almost unknown district of Chaculá, in the Guatemalan department of Huehuetenango, on the frontier of the Mexican state of Chiapas. The discoveries here made proved to be of quite exceptional importance, and so numerous were the monuments surveyed and the objects found in them and in the neighbouring limestone caves, that no less than 50 photographic plates and 282 inset figures and plans have been required to reproduce and illustrate them adequately. The volume, which is of quarto size and printed in bold type on stout paper, is further equipped with a large sketch-map of the district and a very fine map of the surrounding South Mexican and Central American lands.

Chaculá itself is at present a mere hacienda, or farmstead, standing about 5260 feet above sea-level in a thickly wooded, hilly tract which presents geological features analogous to the calcareous Karst formation of the Balkan peninsula. Although now almost uninhabited, except by a few Indians of the Maya-Quiché family, there are abundant indications in the groups of remains scattered over a wide area that the whole district was at one time densely peopled by settled and more or less civilized communities allied to the cultured inhabitants of Palenque, Coban, and the other ancient cities of Chiapas and North Guatemala. These all belonged to the same Maya-Quiché connection, and the remains of all kinds unearthed and examined by Prof. Seler, while often showing interesting signs of independent local developments, present on the whole the same general features as those of the Maya as distinguished from the Aztec types.

This is true, not only of the objects brought to light at Chaculá itself, but also of those found in the Uaxac canal valley, in the Yalambohoch woodlands, in the Cueva de los Pájaros, amid the crumbling monuments of the ancient settlement of Quen Santo with its Temple of the Sun and numerous caves, and in all the other localities visited by the author. Thus the symbols of the Yucatec water-goddess, *th bolon ts'acab*, were recognized on the stone at Cimarron. The god figured on the Piedra redonda near the same site was identified as the Maya god *Oxlahun tox*, the deity of the West, the war-god worshipped by all the Maya peoples, but unknown to the Aztecs, unless he can be brought into some kind of relation with the terrible Tezcatlipoca, called also Yaotl, the "warrior."

But there are, of course, many points of contact between the two cultural systems, and Prof. Seler describes the sites and ground-plans not only of temples, palaces, and pyramids, but also of several *tlachtli* ("tennis-courts") which still exist in the Chaculá district, and correspond in their main features with those already described by himself and other observers both in Mexico and Mayaland. The Mexican enclosures are, as a rule, in a much more dilapidated state than those of Yucatan and Guatemala, and it is interesting to note that from a careful study of the latter he has been able to clear up the Aztec text of Sahágun, who describes the Mexican ball-courts in somewhat vague language. He has much to say on this subject, and we are here reminded that the rubber ball was tossed, not with the hands or feet, but with hips and shoulders, just as Mr. A. R. Wallace tells us the game is still played by the Papuans in some parts of Malaysia. So much for like usages as a test of racial affinities and contacts.

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* 'Die alten Ansiedelungen von Chaculá . . . Guatemala.' Von Dr. Eduard Seler. Berlin: 1901. 'Mittelamerikanische Reisen und Studien aus den Jahren 1888 bis 1900' By Dr. Karl Sapper. Brunswick: 1902.

From the general character of the objects found amid the ruins, in the caves and graves—plain and decorated earthenware, clay masks, stone figures of men and animals, musical instruments of human bones, carved stelæ, incense-burners, rattles, and the like—it is evident that the Chaculá people had made less progress in the arts than the kindred Mayas of Chiapas and Yucatan, whose civilization is represented by the great monuments of Palenque, Coban, Uxmal, Chichen-Itza, Copan, Quiriguá, and the other ancient cities of Central America. By means of the fragments of two inscribed stelæ now embedded in a wall at Sacchaná, but originally from Quen Santo, Prof. Seler essays to determine the approximate date of the Chaculá settlement. These are compared with the hieroglyphs sculptured on the stele M of Copan, to which they are strictly analogous, although more clumsily executed and much more weather-worn. From an elaborate study of these documents, and on the now established principles of the Maya calendric system, it is inferred that all the known Maya monuments, those of Chaculá included, and the temples of Palenque alone excepted, were erected within a period of a few centuries before the discovery. Specialists will find much to interest them in this long essay on Central American chronologies, and some will be surprised to find that the Katunic cycle, for instance, was not 20 years long, as stated by the early writers, nor 24 years, as held by Mr. Cyrus Thomas, but 20 × 360 days, or 19 years + 265 days, the solar year being reckoned at 365 days without bissextile or other intercalary corrections. Needless to say that the seven week-days of Bishop Nuñez de la Vega, corresponding to "the seven planets of the Gentiles," are here also finally disposed of. As the author states emphatically, "Of such a week nothing was known in ancient Mexico or elsewhere in Central America" (p. 95). The more the salient features of the native systems are subjected to critical analysis, the more they are found to diverge from those of the Old World, thus plainly showing that the various civilizations of the aborigines were locally developed independently of all extraneous influences. Were any further proof needed to establish the intimate connection of the Chaculá culture with that of the surrounding Maya populations, it would be supplied by the hieroglyph of the planet Venus, which Prof. Seler found inscribed on a stone at Quen Santo exactly as it occurs on the monuments of Copan and Chichen-Itza and in the still extant Maya pictorial documents.

It should be mentioned that this volume is the first of a series in which the gifted author proposes to work up the rich materials collected by him during his memorable expedition of 1895–97 to Mexico and the Maya lands.

No name has in recent years been more prominent than that of Dr. Sapper in connection with the geographical and economic relations of the Central American States. A sojourn of over twelve years in the Isthmian regions entitles him to speak with some authority on these relations, and the two volumes in which he has given permanent form to his impressions and experiences must be accepted as valuable contributions to our knowledge of these volcanic lands and their turbulent inhabitants. In the first book—'Das Nördliche Mittelamerika,' Brunswick, 1897—was embodied a great mass of valuable information on the southern parts of Mexico and the conterminous states. The second, here under notice, forms a direct sequel and complement to that work, covering the whole of Central America properly so called, from South Guatemala and British Honduras to Costa Rica inclusive. It is by no means a systematic treatise, and the form in which its copious materials are thrown together betrays little regard for the requirements of the general reader. The absence of an index is poorly compensated by a very meagre table of contents, with no numbered chapters, but only a few short headings disposed in two parts, which are not even indicated by any special typographic device, but run together in the body of the text. There is, however, a complete list of the sixty photographic illustrations, which add greatly to the value of the book, some being of very large size, folding in like maps, while all are clearly reproduced by the new processes brought to such perfection in Germany. Quite a panoramic view is thus presented of Antigua, for instance, with its dangerous neighbours, the "Fire" and "Water" volcanoes; of the city of Guatemala; of the Cerro del Tigre in Fonseca bay; of San José, capital of Costa Rica; of Bocas del Toro and its harbour; of the coast district near Aspinwall; and of the flourishing coffee plantations at Coban. Equally welcome are the four large-scale biogeographical maps, one of which shows a new departure in diagrammatic cartography. It must prove of great value to travellers and intending settlers, showing at a glance for the whole region between Tehuantepec and Panama the time required to traverse any given measured distance, this varying from one to as many as fourteen days according to the physical character of the district, the state of the highways, and so on. Hence its name, "Isohemerenkarte," *i.e.* Isohemeral Chart, or, in plain English, Map of Timed Distances.

The first and larger section of the volume is entirely occupied with the various expeditions undertaken from time to time to all parts of the country. But what the descriptions thus necessarily lack in coherence and unity they gain in the charm of a simple unaffected style, and especially of a genuine sympathy with the people and their primitive ways. Volcanic eruptions and earthquakes are welcomed as affording opportunities for scientific investigations "on the spot;" political revolutions break out to clear the atmosphere, or *zur Abwechslung*, "by way of change;" even the interminable hecklings of inquisitive natives are endured with exemplary patience. When about to ascend the Cerro del Tigre, he is asked, "Why do you want to clamber up this mountain?" "And wherefore?" "And for what reason?" "And for what purpose?" "And what do you expect to find up yonder?" "A gold-mine perhaps?" And so on, until the traveller is driven almost mad, and begins himself to wonder why he wastes "so much time and money in such unprofitable studies."

In the second part a measure of unity is given to the volume by the opening sections, in which are ably summed up the results of his observations on the geography, the geology, natural history, and ethnology of the whole region. These are followed by some remarks on the rival Panama and Nicaraguan ship-canal projects, and by a series of essays on the natural resources of the country, the prospects of the coffee, rubber, and indigo industries, with practical suggestions on the laying out of plantations, rainfall records and statistical tables, agricultural and commercial, for all the Central American States.

A. H. K.

OCEANOGRAPHY.

The Voyage of the "Gauss."

The newly founded Institute of Oceanography and the Geographical Institute of the University of Berlin, both presided over by Baron F. von Richthofen, have issued the first part of their publication,* and devoted it to an account of the first stage of the voyage of the German Antarctic Expedition. Baron Richthofen gives an introductory account of the Institute of Oceanography, the functions of which are (1) to maintain an oceanographical museum in which naval, commercial, historical, and scientific exhibits are to find a place, (2) to promote scientific work, (3) to afford instruction, and (4) to improve the knowledge of marine matters and increase the interest in the sea and all that concerns it throughout Germany. The German Antarctic Expedition, which is under the direct auspices of the Government, sends in its reports to the Imperial Department of the Interior, and that department has made them over for publication to the allied "institutes" of the University of Berlin. There has been no delay in so doing, for this report was published in March, and the *Gauss* only reached Cape Town at the end of November.

The report naturally contains nothing about the Antarctic regions, but furnishes a full account of the preliminary training in scientific work at sea by which the members of the expedition have fitted themselves to deal with the new problems of the far south. There are four divisions of the report, viz. I. General narrative of the voyage as far as Cape Town, by Prof. Erich von Drygalski, leader of the expedition. II. Scientific Reports, including (1) description of St. Vincent in the Cape Verde group, by Dr. Emil Werth and Dr. Emil Philippi; (2) oceanographical observations, by Prof. v. Drygalski; (3) the estimation of salinity by chemical processes, by Dr. Philippi; (4) the oceanic deposits, by Dr. Philippi; (5) bacteriological investigations, by Dr. Gazert; (6) biological observations, by Dr. E. Vanhöffen; and (7) magnetic observations, by Dr. Friedrich Bidlingmaier. III. Technical Reports on the ship and navigation, by the chief engineer, Albert Stehr, and Captain Hans Ruser. IV. The Kerguelen Station, by Dr. J. J. Enzensperger.

After leaving the Cape Verdes on September 20, the *Gauss* shaped a southern course with the object of first investigating the great depth reported in 1883 by the French man-of-war, *La Romanche*, near the equator in 18° W., and then visiting the island of Ascension in 14° W. The former object was successfully accomplished, a sounding of 3950 fathoms was obtained in lat. 0° 11′ S. and long. 18° 15′ W., thus completely confirming the great depth which has not hitherto been recognized on official charts. This sounding proves that the East Brazilian depression stretches further to the north-east than was formerly supposed; and the sample of the deposit brought up suggests some entirely new evidence as to the earlier distribution of land and water in the Atlantic area. But on advancing southward the *Gauss* met a freshening south-east trade wind and a strong westerly current, the struggle against which, in the direction of Ascension, shortened each day's run in a disquieting fashion, and at length Prof. von Drygalski deemed it better to abandon the call at Ascension and take advantage of the trade wind by steering south by west. The farthest west was about 21° W. in 24° S., from which point an easterly sweep brought the ship to Cape Town on November 23. On comparing the route and dates with those of the *Discovery*, we see that from 40° to 10° N. the track of the *Gauss* was nearly parallel to that of the *Discovery*, but a few degrees further west; from 10° N. to 26° S. the track of the *Gauss* was alternately a few degrees east or west of the meridian of 19° W., while the *Discovery* took a great westward curve to about 36° W. before reaching Trinidad. The *Gauss's* track eastwards to Cape

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* Deutsche Südpolar-Expedition auf dem Schiff "Gauss" unter Leitung von Erich von Drygalski. Bericht über die wissenschaftlichen Arbeiten auf der Fahrt von Kiel bis Kapstadt und die Errichtung der Kerguelen-Station, mit Beiträgen von Bidlingmaier, v. Drygalski, Enzensperger, Gazert, Philippi, Ruser, Stehr, Vanhöffen, Werth. Berlin: Siegfried, Mittler und Sohn. 1902.

Town was a few degrees north of the parallel track of the *Discovery*. The *Gauss* passed the Lizard and Madeira a fortnight later than the *Discovery*, she crossed the equator a month later, and reached Cape Town seven weeks later. Deducting the time spent in making observations and considering the less favourable route adopted, the speed of the *Gauss* under sail would appear to be a little, but not very much, less than that of the *Discovery*.

So far as can be judged, the most interesting and valuable results of the Atlantic voyage of the German Expedition would appear to be the thirty deep-sea soundings which were taken at carefully selected points, and the biological work, especially the collection of plankton. The magnetic observations at sea may also prove of value, but they will require to be critically discussed before that can be decided. In magnetic work more than any other is it necessary for the observer to become accustomed to the difficulties of observations at sea, and Dr. Bidlingmaier refers feelingly to the difference between the solid stone pillars on which he was accustomed to rest his instruments in the laboratory on shore and the swinging table which has to be used on board ship. A number of determinations of the magnetic elements were made on board, and at Cape Town these were repeated on shore and compared with the Cape instruments, which a few weeks previously had been compared in the same way with those on the *Discovery*.

In addition to the verification of the deepest equatorial sounding known in the ocean, the *Gauss* succeeded in securing fourteen soundings in depths greater than 2500 fathoms. The most southerly sounding in 35° 52′ S., 13° 8′ E., gave a depth of 2750 fathoms, and a long core of the deposit, which was found to consist largely of fine quartz sand. Though within 200 miles of the extreme south of Africa, this sand does not appear to be an extension of the terrigenous deposits bordering that continent, for a shallower sounding very much nearer land revealed a pure globigerina ooze. It is suggested that the sand must have been carried by antarctic icebergs.

It is unnecessary to refer to the trials and comparisons of the various instruments and processes which are described in the report further than to say that the experience of the action of thermometers and townets in tropical waters will have to be revised in the light of similar experience in the polar sea before their suitability or unsuitability can be decided upon. Comparisons of methods of salinity observations are different, and the *Gauss* is very richly supplied with apparatus for alternative methods, including a refractometer and the total immersion hydrometers, on the exceptional value of which Dr. Nansen speaks strongly in his treatise on hydrometers in connection with the results of the *Fram* Expedition.

H. R. M.

THE MONTHLY RECORD.

EUROPE.

Sir John Murray's Survey of the British Lakes.—Considerable progress has already been made with the survey of the British lakes, which is being carried out under the superintendence of Sir John Murray. Since the beginning of April, with the aid of Dr. T. N. Johnston, Mr. James Parsons, Mr. James Murray, and others, twenty lakes had been surveyed before the end of June, chiefly in the basins of the Tay and Spean, the investigations embracing, in addition to the determination of the under-water contours, observations on the temperature-gradients, transparency, bottom deposits, and the microscopic organisms contained in the water. Of the twenty lakes surveyed, only four appear to have been systematically sounded before, viz. Lochs Tay, Earn, Rannoch, and Tummel, which had been examined by Mr. Wilson, of the Geological Survey (Loch Earn also by Sir John Murray and Mr. Pullar). Mr. Wilson's results are, on the whole, confirmed by the recent surveys. The largest lake sounded is Loch Tay (14½ miles in length), the maximum depth of which was found to be 503 feet, and the mean depth 199. The lake forms virtually a simple basin, the portion over 500 feet in depth lying somewhat to the north-east of the centre. There are, however, two areas enclosed by the 300-feet contour, the smaller, which does not reach 400 feet, lying about 3 miles from the south-western end. The proportion of the whole area exceeding 300 feet is 25 per cent., 45 per cent. having depths from 100 to 300 feet, and 30 per cent. under 100. In Loch Tummel (2¾ miles long) the greatest depth found was 128 feet, and the mean 48. There are three basins separated by shallower water, the deepest being near the west end of the lake. In the central basin the greatest depth is 119 feet, and in the eastern 99. Only 10 per cent. of the whole exceeds 100 feet in depth, while 37 per cent. has less than 25 feet. Loch Laidon, which, apart from its western arm, has a length of 5⅓ miles, was found to have the same maximum depth as Loch Tummel, though the mean depth is only 35 feet. In its centre there is an area three-quarters of a mile long with depths exceeding 100 feet, while two or three isolated soundings of more than that amount were found outside the main 100-feet contour. The western arm is shallow and rocky, no greater depth than 17 feet being found here. Of the whole area only 4 per cent. has greater depths than 100 feet, 53 per cent. of the lake-floor being covered with less than 25 feet of water. Of the upper lakes which drain into Loch Laidon, and which lie among glacial moraines in the Black Forest, the largest, Loch Bá, is somewhat over 2 miles long. All are shallow, and the larger ones are irregular in outline and studded with islands. Loch Bá has a maximum depth of 30 feet, and the others of the group are still shallower. Loch Lyon, though only about 1¾ miles long, is fairly deep (maximum 100 feet, mean 45 feet). The deep water lies much nearer the south-western than the north-eastern end; 22 per cent. exceeds 75 feet, half the remainder being deeper and half shallower than 25 feet. Loch Tulla, with a length of 2½ miles, is somewhat shallower than Loch Lyon, the maximum being 84 feet, the mean depth 38; 32 per cent. of the area exceeds 50 feet, and 37 per cent. has less than 25. The main depression lies north-east of the island of Eilean Stalcairichd. Loch Treig (over 5 miles long), of the enormous depth of which many random statements have been made, was found to form a simple basin, 436 feet at its deepest point, in which water over 400 feet in depth extended through a length of nearly two miles about the middle of its length. The mean depth is about 207 feet, and 25 per cent. of the whole exceeds 300 feet. The seiche observed on this lake has already been alluded to in the *Journal*. Of the other lakes sounded, Loch Ossian has a maximum depth of 132 feet, and a mean depth of 42¾ feet, while only 5 per cent. of its area exceeds 100 feet.

The Laufenburg Rapids.—The morainic deposits of the last glacial period covered the old valleys of Northern Switzerland, and the rivers have cut out their beds in these deposits. In many cases they have not found the old bed, and before reaching its level have passed through the morainic terraces to the underlying rock, which is harder to erode. Here rapids are formed, of which that of Laufenburg is an excellent example. The Laufenburg rapids are in gneiss, and extend for some 1300 metres, with an average width of 75 metres, which is reduced to 12 metres at mean water, where a granite dyke crosses the bed at right angles to the river axis. Mr. H. Walter has made an elaborate survey of the region. His maps, sections, and notes have been deposited in the library of the Naturforschende Gesellschaft of Zürich. They will prove most precious documents for the future study of these rapids, and will permit an accurate estimate of denudation if an equally careful survey is made on the same plan a generation hence. A summary of the results, with maps, sections, and views, is given in the *Vierteljahrsschrift* of the Zürich Naturalists' Society (46, 1901). The following table shows the speed of the river at different sections of the rapids during the flood of June 13, 1876.

Kilometres.	Area of cross-section. Square metres.	Speed. Metres per sec.
0·442	1558	3·34
0·551	2106	2·47
0·991	910	5·52
1·442	980	5·31
1·600	2200	2·37
2·548	2060	2·57

Hence the speed is approximately inversely proportional to the cross-section. The difference between the highest and lowest water-level at the bridge at Laufenburg is 17·11 metres. The volume of water passing per second in time of flood may rise to over 5200 cubic metres. In winter it averages about 740, in summer 1235, and the mean of the year is 980 cubic metres per second. The minimum observed is 265 cubic metres per second. Even at the highest flood the erosion is not great, owing to the waters of the Rhine and its most important tributaries having been filtered in lakes, but pebbles exist at the bottom of the river, while the sides of the gorge are rugged owing to weathering. Traces of old river-beds have been found both north and south of the gneiss hill of Great Laufenburg. Mr. Walter agrees with Du Pasquier's conclusion that river deviations taking place on the morainic terraces before the last period of incision prevented the streams from finding their old beds.

ASIA.

Austrian Investigation in Southern Arabia.—Prof. David Müller communicated an account of Dr. Wilhelm Hein's expedition (see *Geographical Journal* for March, p. 370) to the meeting of the philosophical and historical section of the Vienna Academy of Sciences on April 23. Dr. Hein and his wife first made a stay of several weeks in Aden, in order to make photographic and ethnographic surveys and to study the Gibesti dialect; and in this they had the assistance of the British governor, as well as of the Austro-Hungarian consul. They left Aden, accompanied by two servants, on January 22, by the Government steamer *Mayo*, and reached Gishin on the 25th. Gishin (marked Kishin, or Keshin, on the maps) lies east of Aden, beyond Makalla, not far to the west of Ras Fartak, on the Hadramaut coast, in about lat. 15° 25′ N., long. 51° 30′ E. They remained here for sixty-six days, cut off during that time from all communication with the outside world. Their relations with the Sultan, to whom they brought letters of recommendation, were at first fairly good, perfect freedom of movement was allowed, and everything could be obtained for money and fair words; later, however, direct demands for money were made, and as these became more frequent and persistent, and were not acceded to, matters eventually became critical, and the travellers were only rescued by the steamer, which returned on Easter Sunday, and took them back to Aden. During the two months' stay at Gishin, Dr. Hein collected much valuable linguistic material, and made many photographs and sketches. He obtained about two hundred texts in the Mehri language, the dialect of Gishin, including legends and songs, and some Beduin songs. About one-third of these were also written down in the Hadrami dialect, and the remainder edited with notes in Arabic. Of immediate geographical interest are the numerous itineraries which Dr. Hein was able to take down accurately, and his collection of statistics. Over the whole of Gishin, which is 3 to 4 leagues in length and 1 league broad, every house and tent has been set down, with the name of the owner, the number, sex, and approximate age of its inhabitants, and their possessions in cattle, fields, and date-palms—a statistical survey which is unique of its kind in Arabia. Frau Dr. Hein devoted herself more to the natural history of Gishin, and collected eighty species of fishes, and a hundred species of plants, besides lizards, snakes, beetles, etc., in each case with the local names. The attempt to obtain the bloom of the frankincense tree was at first unsuccessful, owing to the unfriendliness of the Sultan of Gishin, but Dr. Hein was fortunate enough to discover a small frankincense tree near the tanks at Aden, from which blossom and leaves, preserved in spirit, are now on their way to Vienna, and will be handed over to the Director of the Botanic Gardens.

The Mishmi Country.—We have already alluded, in noticing the annual report of the Survey of India for 1900, to the reconnaissance of a portion of the Mishmi country carried out during the military operations in that country in 1899–1900. We have since received the report on the Mishmi country drawn up by Lieut. G. L. S. Ward, who took part in the expedition as Field Intelligence Officer, accompanied by a large-scale map of the districts traversed, which lay north-east of Sadiya, to the east of the Dibang river during its course through the hills. Lieut. Ward gives an interesting sketch of the geography and ethnology of the region, and the appended sketches, by Captain Stevens, help towards a realization of its physical character. The hills range up to an altitude of 15,000 feet, and are greatly cut up by watercourses, which run between precipitous banks hundreds of feet below the plateau. The slopes are covered with dense tree-jungle, and the ill-defined paths run up and down at steep gradients, making them extremely dangerous in places. The country traversed is drained by the Ithun, a large river which joins the Dibang from the east. It is deep and swift, with many rapids, and is quite unnavigable. The Midu Mishmis (Chulikatta of the Assamese) occupy both banks of the Dibang, some of the more important villages being situated north of the junction of the Ithun, towards Tibet. East of them, the Mithun (Assamese *Bebejiya*, "outcast") Mishmis occupy the basin of the Ithun, while further east, in succession, are the Digaru, or Taiu, and Meju Mishmis, the latter in the direction of the Dzayul valley. There appear to be only two seasons, the cold weather and the rains, and during part, at least, of the cold weather, much snow falls on the hills. In the rains the whole country is saturated with moisture, which on fine days evaporates in a steamy moisture. The usual jhum system of cultivation is practised, Indian corn, millet, tobacco, opium, etc., being grown. From the Bebejiya country, wax, "Mishmi" or wormwood, and musk are the principal exports, while the Chulikattas export rubber only. Each of the four main divisions of the Mishmis is divided into clans, within which marriage is interdicted. The Chulikattas and Bebejiyas also do not intermarry. The Chulikattas are now somewhat civilized, and the Bebejiyas, though they have been described as ferocious cannibals, seem to be arrant cowards, and the accusation of cannibalism is untrue. The houses vary in length from 40 to 200 feet, and are divided into compartments. There are no houses for bachelors, or for the discussion of public affairs, as among the Abors. The two eastern sections of the tribe have no system of village defence, but palisades were seen among the western sections. Each village, even each house, is quite independent, no settled form of government existing.

The Flora of Tibet.—In a recent number of *Journal of the Linnæan Society*, Mr. W. Botting Helmsley gives a general sketch of the flora of Tibet, as known from the collections brought home by travellers and now in the herbarium at Kew. The paper, in the preparation of which Mr. Hemsley has had the assistance of Mr. H. H. W. Pearson, opens with a history of botanical discovery in Tibet, dealing subsequently with the climate of that region as affecting the vegetation, and sketching the itineraries of the various travellers, with notes on the plants collected at various parts of the route. The systematic list of the plants collected is followed by an account of the general characteristics of the Tibetan flora, as regards form and mode of growth, colour, altitudinal limits, etc. A very large proportion of the species are perennial herbaceous plants, with long thick tap-roots, and almost no stem, which may be either unbranched, bearing a single or compound inflorescence, or very shortly branched, with several inflorescences. When unbranched there is generally a rosette of leaves often lying flat on the ground, and when the stems are branched the leaves are usually very small and numerous. Plants of this description are generally very thinly scattered. Of Gramineæ and allied forms only forty species are at present known, but more probably exist, as abundant pasturages must occur, though in parts grass grows in tufts only. The woody element is exceedingly small, including nothing more than a foot above ground, while fleshy and large-leaved plants, aquatics, and bulbous plants and annuals are also rare. Diminutive plants, some not more than an inch high, with a terminal flower, are, on the contrary, a special feature. As regards the colour of the flowers, there is as much variety and brilliancy in individual blooms as in the British flora, but nothing to equal the intensity of colour characteristic of the alpine flora of Europe. Seeds seem to be ripened freely, and considerable facilities exist for their dispersal; the probabilities of successful germination are, however, small. The conditions are also unfavourable for the spread of plants vegetatively, and the increase in vegetation in Tibet, if any, must be exceedingly slow. On the other hand, there seems no positive evidence that it was ever more general than at present. Mr. Helmsley has entered into the question of the altitudinal distribution with much care, and he finds that some 130 species, or nearly half the total number found in Tibet, have been collected at 16,000 feet and upwards, six of these coming from 18,000 and over. This seems to show that there is no altitudinal limit to flowering plants except perpetual snow. A detailed analysis is made of the flora as regards the orders, genera, and species represented, together with a study of the affinities of the Tibetan flora to those of other regions. This brings out the fact that the bulk of the Tibetan plants have a wide range, 18·7 per cent. occurring in five or more other floral regions, from Persia and the Mediterranean to the Arctic. Forty-seven plants are common to the last-named region and Tibet, but, as might be expected, it is the Himalayan element which is best represented, 217 species, or 76·6 per cent. of the whole, occurring both in Tibet and the Himalayas, while 25·8 per cent. are apparently restricted to these two regions. The general conclusion is that the Tibetan flora is a derived one (derived since the Tertiary period), and it is from the Western Himalaya that the greater migration seems to have proceeded, possibly aided by the prevailing westerly winds.

The Riukiu (Luchu) and Bonin Islands.—The structural features of the island groups south of Japan are discussed in recent papers by Mr. S. Yoshiwara. The first deals with "Raised Coral Reefs in the Islands of the Riukiu Curve" (*Journ. Coll. of Science, Imp. Univ., Tokyo*, 1901, xvi. 1), which forms an arc between Kyūshū and Formosa. They are composed chiefly of Palæozoic rocks—limestones and quartzites found in the west, and clay, slate, sandstone, and pyroxenite or amphibolite on the east. Both dip regularly to the west, and strike parallel to the island axis. These rocks are also found in Formosa. Pre-Tertiary volcanic rocks have been erupted through these. The outer sedimentary zone is of Tertiary rocks. The volcanic fissure is on the inner side of the sedimentary zone, and is continued southwards through the Pescadores. Since the rocks were folded, coral reefs have been built and raised, and are at present irregularly distributed. Hence these islands are homologous with the Lesser Antilles and the Banda islands. The Bonin islands, with which the second paper deals, have generally been regarded as a continuation of the Fuji volcanic chain, but Mr. Yoshiwara shows, in the May number of the *Geological Magazine*, that they really form part of an older and parallel volcanic chain of eocene age, covered with thick horizontal Miocene limestone, and lying a little to the east of the continuation of the younger Fuji volcanic line which passes through the Lot's Wife rock. There are no hot springs or earthquakes in the Bonin chain, but both are common in the Fuji chain, in which eruptions still take place. The Bonin or Ogasawara chain shows that there existed an old line of crustal weakness parallel to the Fuji line before the Japanese islands were formed.

New Journey of Messrs. Sarasin in Celebes.—*Globus* (vol. 82, No. 2) publishes a short note on the latest journey undertaken by Drs. Paul and Fritz Sarasin, the well-known explorers of Celebes. Writing from Macassar on May 10 last, the travellers announce their return, with valuable scientific results, from a journey in the chieftainship of Boni. A visit was first paid to Mount Bowonglangi, about 6500 feet high, on the borders of Boni and Gova. It is steep, and its ascent was toilsome though not dangerous. It is composed of eruptive rocks, which form precipices, but no signs of a crater were seen. A search was then made for a tribe of primitive natives, about whom vague rumours had been heard under the name To Ala (Ala = forest). They were said to dwell in the district of Lamontyong, which was therefore visited; and although difficulties were raised by the Raja, members of the tribe were at last brought in and were inspected by the travellers, who came to the conclusion that they belonged to a more primitive tribe than any yet known on the island. They dwell in caves (of which there are many in the district), plant some maize, are monogamous and truthful, and use no numerals above one. The specimens seen were said to be not so completely wild as some of their kindred, who keep strangers at a distance by throwing stones. The travellers hope, it is said, to make their way from Palopo, on the Gulf of Boni, to the Bay of Palos, in the west, thus crossing Central Celebes from south to north.

AFRICA.

The Du Bourg Expedition in Southern Abyssinia.—An account of this expedition, to which reference has been made more than once in the *Journal*, appears in the June number of *La Géographie*. The leader was supported by several assistants, each of whom undertook a special branch of scientific work, so that the expedition has resulted in additions to our knowledge, not only of the topography, but of the botany, zoology, etc., of the districts traversed. On certain parts of the route M. Du Bourg had been preceded by the Erlanger expedition as well as by Dr. Donaldson Smith and others. The divergences, however, were sufficient to allow of the mapping of a considerable amount of new country. The most important work, from a geographical point of view, was the examination of the country about the headwaters of the Jub and Webi Shebeli and the line of partition between them. The course of the Webi Shebeli itself was also followed for a considerable distance between 7° 15′ and 6° 15′ N., and laid down with greater precision than had previously been done, while the configuration of the country on the left bank within this section was studied. West of the river, a mountainous tract extending towards Giner (Ginea of Donaldson Smith), and separating the

Webi Shebeli from the Web (Jub basin), was examined, as well as the course of the Web itself. South of the Web there is a mountain *massif* with a mean altitude of 11,000 feet, which sends spurs to the east and south, giving rise to many streams flowing to the Upper Jub. Some of these were brought to light for the first time during an advance south to 5½°, which led across the Welmal and other tributaries of the Ganale, reached from the opposite direction by Bòttego. From the pass of Shedom, at the southern edge of the mountainous zone, the view ranges southward over an undulating plateau watered by these streams and falling gently to the Upper Jub. Unlike the treeless grassy plains of the Arussi country, this plateau supports a magnificent vegetation. It is very fertile, and would be adapted for every kind of cultivation. The Gallas formerly burnt clearings in the forest in order to obtain pasturage for their herds, but they have been driven north by famine, and the country is now uninhabited. On the northward route to Adis Ababa the Wabi, or headstream of the Webi Shebeli, was crossed at a point nearer its source than had been reached either by Donaldson Smith or Erlanger. In the map which accompanies the paper the source is placed as far west as 39°. Where crossed it was still an important stream, and its wide valley was inhabited by Galla. The plain of Badda to the north seems to be drained towards Lake Zwai. From the Web a section of the expedition took a more easterly route *viâ* Sheikh Husein, which led, beyond the Wabi, across the almost uninhabited region of Boke. M. Du Bourg sketches the results of the expedition from a geological, botanical, zoological, and medical point of view. As regards geology, considerable interest attaches to the sedimentary strata, which here, as in so many parts of Central Africa, are exactly horizontal. They are found in many isolated positions, but always at the same altitude, the upper limit being 7200 feet.

Wellby's Ruzi.—In commenting, in a recent number of *Globus* (vol. 82, No. 2), on Major Austin's paper published in the June number of the *Journal*, Herr Brix Forster recurs to his contention (cf. *Journal*, vol. xviii. p. 310) that the Ruzi of Wellby is not the Akobo but the Upper Pibor. He makes the surprising statement that Major Austin has now corrected his former view, having thus apparently not read the latter's communication in the March number of the *Journal* (p. 385), in which the English traveller showed in a convincing way the accuracy of his original contention. Some confusion is possibly caused by the fact that Wellby found two streams bearing the native name "Ruzi," but in the letter alluded to Major Austin made it plain, if doubt had existed before, that the river identified by him with the Akobo was that called by Wellby the first Ruzi (by far the more important of the two), as he imagined that it was the same stream as had been found by him flowing from about 4° N. It is only necessary to lay down Wellby's route on any of the recent maps of the Sobat system, reading at the same time the account given of the march down the valley of the Eastern Ruzi from 6° 40′ to 7° 40′ N. in '’Twixt Sirdar and Menelik,' to be convinced that Wellby in this part of his route was following the Akobo, first discovered by Bòttego on his last fatal journey. On the assumption that the Eastern Ruzi is the Pibor, it would be necessary to suppose Wellby's longitudes to be roughly a degree in error; while by introducing the minor correction suggested by Major Austin as regards the lower course of the Ruzi (where not seen by Wellby), the latter's delineation of this river is brought into full agreement with the latest mapping of the Akobo.

Dr. Dantz's Geological Researches in German East Africa.—We have already referred briefly to some of the results of the journeys in East Africa carried out since 1898 by Dr. Dantz for the purpose of geological investigations. During the course of these journeys few important parts of the German East

African territory were left unvisited, the routes extending from the coast to the Victoria Nyanza, Lakes Tanganyika, Rukwa, and Nyasa, besides traversing the intervening districts, together with the greater part of the Rufiji basin, in various directions. The first instalment of a paper, in which both the course of the several journeys and their general and geological results are given, appears in No. 2 of the *Mitteilungen aus den Deutschen Schutzgebieten* for the current year. The geological formations found along the various routes are described with much minuteness, and cannot be discussed here, though the facts thus brought together will form a valuable basis for a knowledge of the structure of the country. A few more general questions are, however, touched upon, and an important discovery was that of a large number of Jurassic fossils at three places in Usaramo, on which a report is inserted by Dr. Hans Menzel. Of interest, too, are Dr. Dantz's remarks on the geological history of the extensive steppes of the gneiss region of the interior. As is well known, they reach a very considerable elevation—little inferior to that of their outer ramparts ("Randbergen"), while from their general surface isolated peaks and ridges ("Inselberge") rise. Both the bounding ranges and the isolated elevations are formed of massive gneiss, while the soil of the steppes is composed of the products of the disintegration of the gneiss, seldom more than 35 feet deep, and is again underlaid by massive gneiss, which has the same structural lines as in the mountains where it reaches the surface. These features are explained as the result of the dislocations to which the archæan rock-masses have been subject, coupled with subsequent chemical and mechanical denudation which has tended to fill the depressions resulting from such dislocations. In the great central gneiss plateau, marked by extreme uniformity, of which Tabora may be taken as the middle point, Dr. Dantz distinguishes two distinct zones—an outer with marked planes of foliation, with a general strike from west-north-west to east-south-east, and a central with rocks either gneissose or granitic in character, in which the most common direction is from north-north-west to south-south-east. Another conclusion of general interest at which Dr. Dantz arrives is that the formation of the Central African rift-valley, in which Tanganyika now lies, was not the work of a single geological epoch, but involved the lapse of long ages. This results from a consideration of the relations of the three formations—gneiss, red sandstone, and diabase—which occur east of the central part of the lake. A useful map embracing the whole of German East Africa, and showing all Dr. Dantz's routes on the scale of 1 : 2,000,000, accompanies the paper.

The Frontiers of the Kamerun.—It is announced that the Commission for fixing the boundary between the Kamerun and French Congo to the east of the former has finished its work, and that the station of Ngoko, north-west of Wesso, which was found to lie within French territory, has been evacuated by the Germans. A map of the southern frontier, as surveyed by Stabsarzt Hoesemann, of the Boundary Commission, is given in the *Deutsches Kolonialblatt* for July 1, with the first instalment of a narrative of the expedition. It completes and corrects the work of Crampel, Fourneau, Lesieur, and Von Stein in this region, and shows once for all that the Ja has no connection with the system of the Ogowe, such as was supposed by Lesieur.

The French in the Lake Chad Region.—An important scientific expedition is being despatched by the French Colonial Office, with the concurrence of other bodies, to the region of the Shari and Lake Chad, under the command of Prof. A. Chevalier, who will be assisted by a competent staff. The objects of the expedition are not political, but it is proposed to study in detail the natural resources of the country, in order to arrive at trustworthy conclusions as to the prospects of commercial development. The expedition will probably be at work at least two years. Meanwhile, it seems to be the intention of the French authorities to pay attention rather to the development of territory already under control, than to seek further extension. By a decree dated July 5 last, the administration of the Congo-Shari territories has been reorganized. The whole of the area up to Lake Chad is placed under one commissioner-general, the separate government of the "Pays et Protectorats du Tchad," which has hitherto formed one of the "Territoires Militaires" of the Sudan, being abolished. The immediate administration of this region may, however, be placed in the hands of a subordinate official responsible to the commissioner-general. It seems to be generally understood that any forward movement in Wadai and Kanem will, under the new *régime*, be for the present, at least, abandoned, while in the Shari basin French action will be limited to a general political supervision.

AMERICA.

Brown-Harvard Expedition to the East Coast of Labrador.—The east coast of Labrador offers unique opportunities for exploration to those who can spare only the months of the long vacation. In 1900 Dr. Delabarre, Professor of Psychology in Brown University, and Dr. Daly, then Instructor in Geology in Harvard University, but now on the staff of the Canadian Geological Survey, with four Harvard undergraduates, spent from July 13 to October 3 on a forty-ton schooner, with which they sailed to Nachvak bay and back. Plants, birds, rocks, and currents were specially studied, and regular meteorological observations were made. Dr. Delabarre has given an account of the expedition in the *Bulletin of the Geographical Society of Philadelphia* (April, 1902), and Dr. Daly has described the ' Geology of the North-East Coast of Labrador" in the *Bulletin of the Museum of Comparative Zoology at Harvard* (vol. xxxviii., February, 1902). The lack of continuous vegetation on the Labrador coast makes geological observations especially easy. The coast lies almost along the axis of a denuded pre-Cambrian mountain range—"a great wilderness of innumerable rounded, ice-worn hummocks, generally gneissic in composition." There is a decided correspondence in altitude of the bedded rocks throughout, and their edges are directed approximately north-east to south-west. This Labrador trend meets the Appalachian trend at right angles in Belleisle, and probably in Newfoundland. Dr. Daly suggests that the margins of the Newfoundland banks are an expression of this intersection. In the belt of 150 miles from Hebron to Cape Chidley the heights are greater, rising to over 5000 feet. These mountains, which Dr. Daly calls the "Torngat Range," differ orographically though not structurally from those to the south, and are "lofty, rugged, and oftentimes serrate," and these higher parts have not been glaciated. The coast is incised by true fiords with irregular floors and "hanging" valleys. The Nachvak fiord was specially mapped both above and below water. The glacial action towards the end of the Glacial epoch did not extend above 2100 feet. Among the glacial markings observed were the "lunoid furrows," not yet fully explained. There are many raised beaches, the highest varying from 250 to 575 feet high, and giving evidence of differential movements in the land since they were formed. Dr. Daly follows De Geer in concluding that uplift has been greatest where the ice formerly was thickest, and that the crust is sufficiently elastic to respond to the removal of the load of a regional glacier. Both the Newfoundland and Labrador coasts are still rising.

POLAR REGIONS.

The Spitsbergen Degree Measurement.—An expedition is being again sent out from Sweden during the present summer to complete the operations for the measurement of an arc of the meridian, which it was impossible to finish last year owing to the unfavourable meteorological conditions. The date fixed for its departure was July 26, when the party was to embark in the *Laura* under the leadership of Dr. Rubin, assisted by Dr. von Zipel as astronomer, and Lieut. Dunér as topographer. Supplies for a year are taken, but it is hoped that the triangulation in the northern part of the Spitsbergen group may be completed by the autumn. An account of the work of the Russian expedition, which, as is known, completed its share of the operations last year, and undertook also important topographical surveys and research into glacial phenomena, has lately been presented by Prof. Chernicheff to the St. Petersburg Academy of Sciences.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Zoo-Geographical Discoveries in the Red Sea.—It is the opinion of most zoologists that the character of a typical deep-sea fauna is determined by the low temperatures occurring in the abysmal depths of the oceans. The dredgings of the *Pola* (Austro-Hungarian Expedition, see *Geographical Journal,* August, 1896, p. 180; January, 1898, p. 75; and December, 1898, p. 571) have, however, led to a result contrary to this view. In the *Sitzungsberichte der Kaiserl. Akademie der Wissenschaften in Wien* (Math. naturw. Klasse. Bd. cx., Abth. i.) Prof. Theodor Fuchs, Director of the palæontological section of the Natural History Museum in Vienna, states the following conclusions, based on a study of the unpublished work of the zoologists of the expedition, Hofrath Steindachner, Drs. von Marenzeller, Penther, and Sturany. The assumption is based on the conditions found in the open ocean, where, in the tropics, the fall of temperature with increase of depth takes place so rapidly that the change in the fauna appears to coincide with it. But in certain parts of the Pacific, especially in the regions round New Guinea, the Solomon islands, the New Hebrides, the Fijis, and Samoa, the temperature at 180 metres (100 fathoms) is 18° to 21° C. (64° to 70° F.), and a characteristic fauna is found which, in its siliceous sponges, deep-sea corals, stalked crinoids, etc., closely corresponds to the fauna occurring at a depth of 1100 metres (600 fathoms), in a temperature of 5° C. (41° F.), off the Kermadec islands, north of New Zealand. Further, temperatures of 12° to 13° C. (53° to 55° F.) are found at the greatest depths in the Mediterranean, and a typical fauna occurs there at a depth of 200 metres. These examples of high temperature in the depths are far exceeded in the Red Sea, where the temperature of 23° C. (73° F.), corresponding to the limits of the coral reefs, extends down to 300 metres (160 fathoms), and even in the greatest depths (2190 metres, or 1200 fathoms, in lat. 20° N., south-south-west of Jiddah) the temperature does not fall below 21° C. (70° F.). The *Pola* Expedition is the first to obtain information about the fauna of such a region. The typical organisms of a deep-sea fauna are the siliceous sponges, of which specimens were first found off the island of Cebu in the Philippines, where the natives, using their own tackle, take them in large quantities from depths of 200 metres. The *Challenger* obtained them in 150 metres (80 fathoms), near the same place, and the dredge brought up a specimen from 130 metres (70 fathoms) near Kerguelen; but they have never been found in shallower water or on the littoral, although abundant in the deep waters of all seas from pole to pole. In the Red Sea siliceous sponges were brought up by the dredge from 690 metres (380 fathoms), an indication at once of the nature of the fauna. The frequent occurrence of Neæra was also remarkable, just as in the open ocean, where it is rarely absent; in the *Challenger* dredgings Neæra was often the only Lamellibranch. Other widely distributed and characteristic forms, such as Amussia, Verticordia, etc., were also obtained in the warm depths of the Red Sea; a true deep-sea fauna being, in effect, met with at a depth of 200 metres, in temperatures of 23° to 34° C. (73° to 75° F.), and down to 900 metres (490 fathoms). Few deep-sea fishes were obtained; Steindachner enumerates only five species between 340 and 1150 metres (190 to 630 fathoms), but it is remarkable that amongst them, and amongst the deep-sea crabs, were many found in the Mediterranean, notwithstanding the great difference in the temperature conditions in the two seas. The general conclusion to be drawn is that the fauna inhabiting the Red Sea at depths below 100 fathoms, although it has certain minor peculiarities, is a typical deep-sea fauna, in spite of prevailing temperatures of 21° to 24° C. (70° to 75° F.).

The Migration of Birds.—With reference to the note on this subject in the last number of the *Journal* (p. 108), and Dr. Floericke's statement, there quoted, that "Mountain ranges stretching across the line of flight are avoided (by birds) even at the cost of a considerable circuit," a correspondent writes: "This may be true as a rule, but it has large exceptions. Three or four separate exploring parties have found the surface of the upper portion of the Bezingi glacier and other Caucasian glaciers strewn with the corpses of migratory birds, which had evidently perished from storm and cold (see Merzbacher's 'Kaukasus,' vol. i. p. 745). The Bezingi glacier lies under the loftiest portion of the Caucasian watershed." It may also be mentioned that though Dr. Floericke speaks of the three southern peninsulas as supplying the natural bird-highways between Europe and Africa, he shows on his map other routes following the east and west coasts of Corsica and Sardinia.

Experimental Botanical Geography.—Under this title Prof. Bonnier of Paris describes his latest researches on the subject of plant physiology and distribution (*Annales de Géographie*, May, 1902). Seven or eight years ago he showed that plants transported from the plains to 6000–8000 feet soon acquire the structure and function of alpine species. His new experiments are of two kinds. In the first he took selected herbaceous plants (such as the common primrose, columbine, strawberry, dog-violet, stinking hellebore, *Carex cæspitosa*, etc.) from beds in the Garden of Experimental Botany at Fontainebleau, and a number of cuttings from common trees and shrubs (such as beech, lime, fuschia, lilac, gooseberry, etc.), and planted them in a garden near Toulon, planting at the same time, in the case of the cuttings, some of them at Fontainebleau. To counteract any differences in soil, some of the herbs, shrubs, and trees were grown at Fontainebleau on soil transported from the Toulon garden. Notable differences were observed from the first year in the form and functioning of nearly every species. At Toulon the plants developed a woodier stem, broader, thicker, more coriaceous and less indented leaves, with more marked nerves, often persisting longer on the stem, from which the branches diverged at a wide angle. These are normal characteristics of Mediterranean plants, which pass through two resting periods in the year—during the drought of summer and during the cold of winter—and in the case of the persistent plants cultivated at Toulon, it was found that two zones of vessels were formed, one in spring and one in autumn, separated by a zone of wood almost free from vessels. The walls of the peripheral cells were thickened in the south, the stomata were more sunken, and hairs often became more abundant. That is to say, that a great number of plants of the temperate zone change their form and structure in adapting themselves to the Mediterranean climate. Once more we have an illustration of the now generally accepted fact that climate is the prime factor in plant distribution. Prof. Bonnier has made even more ingenious experiments. Bringing plants, such as *Saxifraga oppositifolia*, *Silene acaulis*, and *Salix reticulata*, from the alpine zone of the Pyrenees in spring, he subjected them, in the underground chambers beneath the central market of Paris, to constant light and moist cool temperatures such as characterize Spitsbergen in summer.

The form and structure were again modified, and became of Spitsbergen instead of Pyrenean type. Another set of experiments consisted in taking plants growing round Paris, and at the Fontainebleau botanical station putting them out all the summer day in normal conditions, but at night setting them in a room near the freezing point. In the first season, but much more markedly at the end of the second year, after being covered all winter with snow, they possessed almost all the external characters, internal structure, and physiological functions of alpine plants. This shows that the chief characteristics of alpine species are directly due to the plants having to live in diurnal alternations, not merely of light but of extremes of temperature. These laboratory experiments are even more striking than the garden ones previously recorded, and in addition to their bearing on the question of plant geography, they have an almost greater interest in connection with investigations into the part played by the environment in the evolution of organisms. It may, however, be remarked that, according to the view of Prof. De Vries, whose experiments in the production of new forms of *Œnothera* have lately been described in *Science*, changes in environment cause adaptation only, not variation, the former standing in no relation to heredity or the origin of species, while the latter is quite independent of environment.

New Geographical Serial.—The recent addition to the existing geographical serials in the German language, which has been made in the form of a new magazine published by the firm of Hölzel, of Vienna, under the editorship of Prof. Franz Heiderich, promises to be of value, both as regards its method and objects. The *Vierteljahrshefte für den Geographischen Unterricht*, of which the fourth part was issued in July, have, under the judicious management of their editor, already aroused an interest in geographical circles, and may be said to have already established an assured position. The new periodical takes an intermediate place between those publications on the one hand which are mainly devoted to the dissemination and discussion of the results of geographical research, and on the other those whose chief aim is educational, such as the *Zeitschrift für Schulgeographie*, also published in Vienna. Its promoters consider with justice that a gap exists between the geography at present studied in the higher educational establishments and that which is taken up as a necessary part of the ordinary school curriculum. The numbers of the new magazine which have so far appeared show the efforts which it is making to bridge over this gap, on the one hand by articles which aim at giving a more scientific character to the school teaching, on the other by a discussion of the wants felt by those engaged in higher education as a result of the defects in the middle and lower schools. Its contents include papers on scientific geography and methodology, descriptions of typical geographical features, a summary of the results of current research, and, last but not least, detailed and critical reviews of geographical literature, both books and maps.

CORRESPONDENCE.

Mr. Freshfield's Paper on the Glaciers of Kangchenjunga.

I HAVE read with much pleasure the extremely interesting paper by Mr. Freshfield on the glaciers of Kangchenjunga, which appeared in the April number of the *Journal*. Messrs. Freshfield and Garwood have supplied a valuable addition to our geographical knowledge of that glacier region, a point which is a weak one in our Indian Survey maps. As the shortcomings of these are necessarily somewhat prominently brought forward, it will perhaps be of interest if I explain the conditions under which such maps have been constructed, and the views of the

Government of India, as represented by the Survey of India, on the surveys and mapping of such outlying portions of the Indian Empire and contiguous countries.

As soon as any country comes under the direct rule or influence of the Government of India it has always been deemed a first essential to provide as quickly as possible, for administrative and military purposes, a map of it. In such cases survey-parties are at once sent forward to carry out a reconnaissance survey of the country in question. These are usually executed on a scale of 4 miles = 1 inch, and are always based on triangulation. As they are pushed forward with the utmost speed compatible with sufficient accuracy for the purpose required, it follows that, in the more inaccessible portions of the country, which have little value either from the military or administrative point of view, it would be a waste of time and money to make an elaborately accurate survey of minor details. In subsequent years, should the country become more important from any point of view, larger-scale maps, usually on the 1-inch scale, are constructed. Even in these latter, however, minute accuracy of detail in the more inaccessible portion of the mountainous regions would not be insisted on, as the cost of such surveys would be out of all proportion to their value to the Government.

In illustration of the above, I may cite the surveys of the North-West Himalayas, which were undertaken between 1850 and 1862, soon after we obtained free access to the country. During those years a reconnaissance survey of that region, reaching from Nepal on the east up to and including Kashmir on the west, was carried out. This survey was based on a very complete and far-reaching system of triangulation, all prominent peaks coming within view of the triangulators being fixed. The topography was surveyed with the plane-table, mainly on the scale of 4 miles = 1 inch, though parts of Kashmir were mapped on the ½-inch scale.

The survey was on the whole wonderfully accurate, if one considers the speed at which it was carried out. Each survey-party brought back annually completed surveys of from 10,000 to 13,000 square miles, the average out-turn of each individual surveyor being from 2000 to 2500 square miles. It will be seen from these figures that any attempt at surveying the full detail of glaciers and of the higher mountains was out of the question; the marvel is how even such accomplished surveyors as Colonel Godwin Austen and those associated with him were able to get so great an amount of accurate detail in so short a time.

In later years—about 1870—it was found that this reconnaissance survey was on too small a scale for the proper administration of the British districts of Kumaon and Garhwal, and a complete topographical map of those districts on the scale of 1 inch = 1 mile was made. Similarly, lately, the hill-districts of Kulu and Kangra have been surveyed for administrative purposes on a large scale. The remaining portions of the older reconnaissance being in native territory have up to the present sufficed for the needs of Government.

On the east of the Himalayas, in Sikkim, this preliminary reconnaissance survey was also carried out, though at a much later date. The country was not so thoroughly surveyed as the more western regions, the work partaking more of the nature of a reconnaissance, many of the outlying valleys being only sketched from a distance.

It will be seen from the above that no attempt has been made in the surveys of the Himalayas to delineate in close detail the peaks and glaciers of the higher mountains, and it seems unlikely that such work will be taken in hand by the Survey Department. We must therefore look to enterprising travellers and skilled mountaineers, such as Messrs. Freshfield and Garwood, who possess the necessary ability and determination, to map out the more intricate detail of rock and glacier.

The Survey of India will only too gladly accept such additions to their knowledge whenever it is evident that the work is up to the required standard of accuracy. It should be recollected, however, that the criterion of goodness is not the beauty of the finished map, but the method employed in the survey and the skill with which it has been accomplished.

There is one point in Mr. Freshfield's paper about which I would like to say a word—I refer to the note at the foot of p. 460, which runs as follows: "Sir T. Holdich has informed me that the cartographers were authorized to supply conventional detail where no authentic detail was forthcoming." I cannot help thinking that there must be some misunderstanding about this. After a service of thirty years in the Indian Survey Department, and having been employed for the greater part of that time on Himalayan and frontier surveys and mapping, I can only say that I have never heard of any such authorization. So far from this being the case, it has always been laid down that, while officers employed on reconnaissance surveys are to attempt to fix and sketch all detail which they see, however distant it may be (as it may possibly never be seen again), they are invariably to show, by the method and style of their drawing, the difference between work actually surveyed in detail and that sketched from a distance. In fact, the late General Walker, in one series of frontier maps, combined both the horizontal and vertical systems of hill-shading, the former to show ground actually surveyed, and the latter that which was merely sketched. In no case, however, has it been permitted to fill in conventional detail when no such detail has been seen. Such a proceeding would absolutely spoil the value of any map.

As the surveys are invariably executed by plane-table, they are brought in in a finished state, and the cartographers, *i.e.* those who draw the fair maps for publication, have nothing to do but to redraw the plane-table sheets in a method suited for our system of publication by photozincography, and are strictly forbidden to add or alter anything in the originals.

It, of course, does not follow that all detail shown on an Indian Survey map is strictly accurate. The best of surveyors are occasionally deceived by the apparent lie of mountain ranges and streams when sketched from a distance, and occasionally it may happen that surveyors, set to work in the more inaccessible regions where their maps cannot readily be checked, either through laziness or inability, bring in work shown as accurately surveyed which, on subsequent examination in after years, turns out to be anything but correct. Such cases are, however, I am glad to say, of rare occurrence.

St. George Gore,
Colonel R.E.
Surveyor-General of India.

June 16, 1902.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Is. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. **Whymper.**

The Valley of Zermatt and the Matterhorn. A guide by Edward Whymper. 6th edition. London: John Murray, 1902. Size 7½ × 5, pp. xiv. and 224. *Maps, Plans, and Illustrations. Price 3s. net. 2 Copies, one Presented by the Author, the other by the Publisher.*

Alps—Mont Blanc. **Whymper.**

A Guide to Chamonix and the Range of Mont Blanc. By Edward Whymper. 7th edition. London: John Murray, 1902. Size 7½ × 5, pp. xiv. and 206. *Maps and Illustrations. Price 3s. net. 2 Copies, one presented by the Author, the other by the Publisher.*

Ardennes. *Naturw. Wochenschrift* 1 (1902): 233–236. **Wagner.**

Die Ardennen. Eine geologisch-geographische Skizze. Von Dr. Phil. P. Wagner. *With Map.*

Austria—Bohemia. *Deutsch. Rundschau G.* **24** (1902): 359–362. **Wagner.**

Aus dem Mittelgebirge Deutschböhmens. Von Eduard Wagner. *With Illustrations.*

Balkan Peninsula. *Z. Ges. Erdk. Berlin* (1902): 196–214. **Cvijić.**

Forschungsreisen auf der Balkan-Halbinsel. Von Prof. Dr. J. Cvijić.

Balkan Peninsula—Railway. *Globus* **81** (1902): 341–346. **Meinhard.**

Die Balkanbahnen in ihren Beziehungen zur Bagdadbahn. Von Friedrich Meinhard. *With Map.*

Belgium—Haine. **Cornet.**

Quelques remarques sur le bassin de la Haine. Par J. Cornet. (Extrait des Annales de la Société géologique de Belgique, t. xxvii., Bulletin.) Liége, 1900. Size 9½ × 6½, pp. 8. *Presented by the Author.*

Central Europe. *G. Tidskrift* **16** (1901–1902): 173–183. **Vahl.**

De kvartære Stepper i Mellemevropa. Ved M. Vahl.

On the steppe-period which came between and after the glacial periods in Central Europe.

France. *B.S.G. Com. Bordeaux* **28** (1902): 125–135, 159–166. **Saint-Jours.**

Les fleuves côtiers de Gascogne. Par Capitaine Saint-Jours. *With Illustrations.*

France—Brittany. *B.S. Bretonne G.* (1901): 192–201. **Layec.**

Renseignements statistiques sur la Bretagne. Par A. Layec.

France—Census. *Deutsch. Rundschau G.* **24** (1902): 274–276. ———

Die Ergebnisse der Volkszählung in Frankreich vom 24. März 1901. *With Map.*

France—Meteorology. *Ann. G.* **11** (1902): 111–116. **Passerat.**

Essai d'une carte de la répartition des jours de gelée en France. Par C. Passerat. *With Map.*

France—Pyrenees. **Lacoste and Verdun.**
Annuaire Club Alpin Français **27** (1900): 244–261.

Exploration de la région des lacs du Pic du Midi (massif de Néouvielle). Par M. A. Lacoste et M. le Dr. P. Verdun. *With Illustration.*

Germany. *Jahresb. G. Ges. München* (1900–1901): 1–37. **Tein.**

Beziehungen zwischen Niederschlag und Abfluss im Maingebiete. Von Maximilian von Tein. *With Map and Diagrams.*

Abstract from the work on the Main region, published by the Baden 'Zentralbureau für Meteorologie und Hydrographie.'

Germany—Baden—Kaiserstuhl. *Ann. G.* 11 (1902): 144–152. **Demangeon.**

Contribution à la géographie du Kaiserstuhl en Brisgau. Par A. Demangeon. *With Map and Plates.*

The Kaiserstuhl is an ancient volcano between the Upper Rhine and the Black Forest.

Germany—Bavaria. *Jahresb. G. Ges. Munchen* (1900-1901): 38–57. **Ebert.**

Seespiegelschwankungen im Starnberger See. Von Hermann Ebert. *With Diagrams.*

Germany—Bavaria. *Jahresb. G. Ges. München* (1900-1901): 76–98. **Gruber.**

Die 1896 bis 1900 zur Landeskunde Bayerns erschienene wichtigere Literatur. Von Dr. Christian Gruber.

Germany—Bavaria. *Jahresb. G. Ges. München* (1900-1901): 58–75. **Ule.**

Die Entstehung und die physikalischen Verhältnisse des Würmsees. Von Willi Ule.

A summary of the results of the author's examination of the Würmsee, which have already been published in a memoir (cf. *Journal,* vol. xix. p. 381).

Germany—Elbe. *Ann. G.* 11 (1902): 54-67, 134–143. **Auerbach.**

La régime de l'Elbe. Par B. Auerbach.

Based on the great official work issued in 1898, but written with full knowledge of other literature on the Elbe.

Germany—Meteorology. **Perlewitz.**

Versuch einer Darstellung der Isothermen des Deutschen Reichs für Jahr, Januar und Juli nebst Untersuchungen über Regionale thermische Anomalieen. Von Dr. Paul Perlewitz. (Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Vierzehnter Band, Heft 2.) Stuttgart: J. Engelhorn, 1902. Size 9½ × 6½, pp. 79–150. *Maps.*

Germany—Prussia. *Globus* **81** (1902): 277–279. **Wüst.**

Nachweis diluvialer Brackwasseransammlungen im Gebiete der heutigen Mansfelder Seen. Von Dr. Ewald Wüst.

Germany—Saxony. *M.V. Erdk. Leipzig* (1901): 89–149. **Bohn.**

Die Siedelungen in der Leipziger Tieflandsbucht nach Lage und Gestalt. Von Dr. Richard Bohn. *With Map.*

Five types of settlements are distinguished on the map.

Holland. *Popular Sci. Monthly* **60** (1902): 551–555. **Gore.**

The Draining of the Zuider Sea. By Prof. J. H. Gore.

Holland. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **19** (1902): 296-327. **Lorié.**

De verhouding tusschen den Rijn en het landijs. Door Dr. J. Lorié. *With Map.*

On the influence of the ice of the glacial epoch on the former course of the Lower Rhine, as evidenced by old river-terraces.

Hungary—Carpathians. *Annuaire Club Alpin Français* **27** (1900): 262–299. **Vielliard.**

Dans les Karpates; les Hautes-Tatry. Par M. Edme Vielliard. *With Illustrations.*

Iceland. *La G., B.S.G. Paris* **5** (1902): 153–154. **Lapparent.**

La Carte géologique de l'Islande par M. Thoroddsen. Par A. de Lapparent.

Montenegro. *B.S.G. Italiana* **3** (1902): 129–148, 243-267. **Baldacci.**

Nel Montenegro Sud-Orientale, conferenza del socio dott. A. Baldacci. *With Illustrations.*

Montenegro. **Cora.**

Guido Cora. Nel Montenegro. Impressioni di Viaggio (1899). Roma, 1901. Size 10 × 6½, pp. 72. *Illustrations. Presented by the Author.*

A useful addition to the scanty literature on Montenegro.

Northern Europe. *Deutsche Rundschau G.* **24** (1902): 295–306. **Stavenhagen.**

Nordisches Kartenwesen. Von W. Stavenhagen.

On the present position of official cartography in Norway, Sweden, and Denmark.

North Sea. ———

North Sea Pilot. Part iv. The Eastern Shores of the North Sea, from Cape Gris Nez to the Skaw. Sixth edition. London: Eyre & Spottiswoode, 1901. Size 9½ × 6, pp. xxiv. and 286. *Price 2s. 6d. Chart. Presented by the Hydrographer, Admiralty.*

Norway—Finmark. **Karlsen and Storm.**

Norske G. Selsk. Aarbog **12** (1900–1901): 1–23, 177–178.

Finmarkens Beskrivelse af Erkebiskop Erik Walkendorf. Af dr. K. H. Karlsen og dr. Gustav Storm. *With Facsimile.*

Reproduction of the Latin text (with translation) of a manuscript description of Finmark contained in the Vatican archives, which seems to have been used by Olaus Magnus.

Russia—Finland—Language. *Ymer* **22** (1902): 15–18. **Wiklund.**

Finska språkets nuvarande utbredning i Värmland och Grue finnskog. Af K. B. Wiklund. *With Map.*

Russia—Glacial Action. **Arçtowski and Bertrand.**

Notice sur l'abrasion glaciaire. Par Henryk Arçtowski. Action des anciens glaciers sur le relief actuel de la Russie. Par J. Bertrand. (Extrait du Bulletin de la Société Belge de Géologie, etc. Tome xv., 1901, pp. 693-701. *Maps.*) Bruxelles, 1902. Size 9½ × 6½. *Presented by M. J. Bertrand.*

Scandinavia. *Ann. G.* 11 (1902): 117–133. **Högbom.**

Sur la tectonique et l'orographie de la Scandinavie. Par A. G. Högbom. *With Map.*

Spain. *Z. Ges. Erdk. Berlin* (1902): 165–168. **Ramann.**

Das Vorkommen Klimatischer Bodenzonen in Spanien. Von Prof. Dr. E. Ramann. *With Map.*

Spain—Majorca. *Annuaire Club Alpin Français* **27** (1900): 300-319. **Vuillier.**

Aux rivages de Majorque: souvenirs des pirates barbaresques. Par M. Gaston Vuillier. *With Illustrations.*

Straits of Gibraltar. *J.S. Arts* **50** (1902): 462-487. **Crease.**

Ceuta and Gibraltar. By Major-General John F. Crease. *With Maps.*

The writer advocates the exchange of Gibraltar for Ceuta, and makes remarks on the possibilities of development offered by Morocco.

Sweden. *B. Union G. Nord de la France* **23** (1902): 18-31. **Lefébure.**

Voyage en Suède. Par A. Lefébure. *With Illustrations.*

Switzerland. *Le Globe, B.S.G. Genève* **41** (1902): 24-31. **Krafft.**

Éboulement préhistorique de Flims. Par M. A. Krafft.

This old landslip, which blocked the course of the Vorder Rhein, has an area of 52 square kilometres.

Switzerland. **Messerschmitt.**

Internationale Erdmessung. Das Schweizerische Dreiecknetz herausgegeben von der Schweizerischen geodätischen Kommission. Neunter Band. Polhöhen und Azimutmessungen. Das Geoid der Schweiz. Im Auftrage ausgeführt und mit Ausnahme der Kapitel ix. und xxiv. bearbeitet von Dr. J. B. Messerschmitt. Zürich: Fäsi & Beer (vorm. S. Höhr), 1901. Size 12 × 9, pp. viii. and 252. *Plates.*

Switzerland. **Streun.**

Die Nebelverhältnisse der Schweiz. Inaugural-Dissertation zur Erlangung der Doktorwürde der hohen philosophischen Fakultät der Universität Bern vorgelegt von Gottfr. Streun. (Sonder-Abdruck aus den Annalen der Schweizerischen meteorologischen Centralanstalt, Jahrgang, 1899.) Zürich, 1901. Size 11 × 9½, pp. 40. *Maps. Presented by the Author.*

Switzerland—Laufenburg. **Walter.**
Vierteljahrs. Naturforsch. Ges. Zürich **46** (1901): 232-263.
Ueber die Stromschnelle von Laufenburg. Von Heinrich Walter. *With Plan and Illustrations.*

Gives the results of a careful geological and topographical survey (cf. *ante*, p. 225).

Turkey. *Deutsche Rundschau G.* **24** (1902): 317-321. **Braun.**
Ein Ausflug zum Alem-Dagh. Von Fritz Braun.

United Kingdom. *Rep. Brit. Assoc.* (1901): 283-288. ———
Erratic Blocks of the British Isles. Report of the Committee.

United Kingdom—Hertfordshire. **Tompkins.**
Highways and Byways in Hertfordshire. By Herbert W. Tompkins, with Illustrations by Frederick L. Griggs. London: Macmillan & Co., 1902. Size 8 × 5½, pp. xiv. and 348. *Map and Illustrations. Price* 6*s*. *Presented by the Publishers.*

This is one of the most pleasantly written of the volumes of the 'Highways and Byways' series. The author shows a keen appreciation of the quiet rural beauties which are the main charm of the county, and he gives some fascinating pictures of its woodlands, narrow winding lanes, and rich green meadows. The illustrations do their part well in presenting such scenes to the mind, and give many instances of the picturesque country churches and other architectural objects in the county.

United Kingdom—Humber. *Rep. B. Assoc.* (1901): 652-653. **Wheeler.**
The Source of Warp in the Humber. By W. H. Wheeler.

United Kingdom—London. ———
Census of England and Wales, 1901. County of London: Area, Houses, and Population; also Population classified by ages, condition as to marriage, occupations, birthplaces, and infirmities. London: Eyre & Spottiswoode, 1902. Size 13 × 8½, pp. xvi. and 176. *Map. Price* 1*s*. 9*d*.

United Kingdom—Meteorology. **Rambaut.**
Results of Meteorological Observations made at the Radcliffe Observatory, Oxford, in the eight years 1892-1899. Edited by Arthur A. Rambaut. Vol. xlviii. Oxford: J. Parker & Co., 1901. Size 10 × 6½, pp. xxiv. and 246. *Plates. Presented by the Trustees of the Radcliffe Observatory.*

United Kingdom—Scotland. *Rep. Brit. Assoc.* (1901): 720. **Smith.**
Methods and Objects of a Botanical Survey of Scotland. By W. G. Smith, B.SC.

United Kingdom—Scotland—Meteorology. **Buchan.**
J. Scottish Meteorolog. S. **12** (No. 17): 3-12, 12-20.
Fogs on the Coasts of Scotland. By Dr. Buchan. Storms on the Coasts of Scotland. By the same.

United Kingdom—Scotland—Shetland Islands. **Jakobsen.**
Aarb. Nord. Oldk. Hist. Kjøbenhavn **16** (1901): 55-258.
Shetlandsøernes Stednavne. Af Jakob Jakobsen.

A very thorough study of the place-names of the Shetlands.

United Kingdom—Temperature. ———
Temperature Tables for the British Islands. Daily Means for the Thirty Years 1871 to 1900, with Diagrams and Additional Tables. London: Eyre & Spottiswoode, 1902. Size 12½ × 10, pp. xiv. and 120. *Price* 10*s*. 6*d*. *Presented by the Meteorological Office.*

United Kingdom—Wales. *Quarterly J. Geolog. S.* **58** (1902): 207-225. **Strahan.**
On the Origin of the River-System of South Wales, and its Connection with that of the Severn and the Thames. By Aubrey Strahan. *With Map.*

This was noticed in the Monthly Record for July (p. 97).

ASIA.

Arabia. *Asien* 1 (1902): 127-129. **Schlagintweit.**
Die Mekkabahn. Von Major Max Schlagintweit. *With Map.*

Armenia. *Z. Ges. Erdk. Berlin* (1902): 290-292. **Rohrbach.**
Die abflusslosen Seen auf dem Armenischen Hochland. Von Dr. Paul Rohrbach.

The author urges the need of meteorological stations in Armenia in order to supply accurate data regarding the regime of the lakes and rivers.

Asia. **Wood.**

The Eastern World. A Commercial Geography for Pupil Teachers and Senior Students. By C. A. Wood. Bristol: Scholastic Trading Co. Size 8½ × 5½, pp. 16. *Maps. Price* 6*d. net.*

A short summary of facts relating to the commercial geography of the East.

Asia—Marco Polo's Travels. **Minaef.**

Zap. Imp. Russ. G.S. (*Ethnog. Sec.*) **26** (1902): pp. 356.

I. P. Minaef. Travels of Marco Polo. Translated from the old French text. [In Russian.]

Asia Minor. *Asien* **1** (1901): 43–45. **Körte.**

Kleinasien und der Westen im Altertum. Von Prof. Dr. A. Körte.

Central Asia. *Z. Ges. Erdk. Berlin* (1902): 333–335. **Hedin.**

Ueber die letzte Reise von Dr. Sven Hedin.

Ceylon—Veddahs. **Hiller and Furness.**

Notes of a trip to the Veddahs of Ceylon. By Dr. H. M. Hiller and Dr. W. H. Furness. Size 9 × 6, pp. 46. *Illustrations.*

China—Kiangsu. *Rev. G.* **50** (1902): 218–237. **Gadoffre.**

Le pays des canaux. Essai sur la province du Kiang-sou. Par Capitaine F. Gadoffre. *With Map.*

China—Manchuria. *G.Z.* **8** (1902): 185–204. **Immanuel.**

Die Mandschurei. Von Hauptmann Immanuel.

China—Manchuria. *Questions Dipl. et Colon.* **13** (1902): 548–552. **Bidou.**

Le règlement des affaires mandchouriennes. Par Henry Bidou. *With Map.*

China—Shensi. *Annuaire Club Alpin Français* **27** (1900): 356-382. **Leprince-Ringuet.**

En Chine. Ascension de la montagne sainte le T'aè-Houa-Chan. Par M. F. Leprince-Ringuet. *With Illustrations.*

China—Yunnan. **d'Anty.**

P. Bons d'Anty. Excursions dans le pays Chan Chinois et dans les Montagnes de Thé. (Série d'Orient No. 3.) Shanghai, 1900. Size 10 × 7½, pp. 66. *Map. Presented by the Author.*

Chinese Empire. *Is. Imp. Russ. G.S.* **37** (1901): 233–353. **Kozloff.**

Account of the expedition of P. K. Kozloff. [In Russian.]

Chinese Empire. *La G., B.S.G. Paris* **5** (1902): 273–278. **Deniker.**

Voyage du Lieutenant Kozlov en Asie Centrale. Par J. Deniker. *With Map.*

French Indo-China—Annam. **Cadière.**

B. l'Ecole Française d'Extrême-Orient **2** (1902): 55–73.

Géographie historique du Quang Binh d'après les *Annales Impériales.* Par le R. P. Cadière. *With Sketch-maps.*

India. **Crosthwait and Roberts.**

Tide-Tables for the Indian Ports for the year 1902 (also January, 1903). By Captain H. L. Crosthwait and E. Roberts. 2 vols. Vol. i. Western Ports (Suez to Pámban Pass). Vol. ii. Eastern and Burma Ports (Galle to Port Blair). Size 6½ × 4, pp. (vol. i.) 1–611, (vol. ii.) 612–1204.

India—Botanical Survey. ———

Report of the Director of the Botanical Survey of India for the year 1900–1901. Size 13½ × 8½, pp. 24.

India—Marine Survey. ———

Administration Report of the Marine Survey of India for the official year 1900–1901. Bombay, 1901. Size 13 × 8½, pp. 8. *Presented by the Survey.*

India—Punjab. ———

Report on the Administration of the Punjab and its Dependencies for 1900–1901. Lahore, 1902. Size 13 × 8½, pp. xiv., 10, 170, and ccxlvi. *Map and Diagram.*

India—Sanjân. *J. Bombay Br. R. Asiatic S.* **21** (1901): 4–18. **Modi.**

The ancient name of Sanjân. By Jivanji Jamshedji Modi, B.A.

The writer holds that the small town of Sanjân, near Bombay, is not the Sindan of the Arab geographers, which is rather to be placed in Cutch, but is the same as the Hanjamana of documents of the tenth and eleventh centuries.

India—Santals. *Norske G. Selsk. Aarbog* 12 (1900–1901): 24–49. **Bodding.**

Santalfolket i fortid og nutid af missionspræst P. O. Bodding. *With Illustrations.*

On the traditions, customs, etc., of the Santals.

Indian Ocean—Cocos Islands. **Carter.**

Cocos Islands. Report for 1901. Colonial Reports, Annual No. 352, 1902. Size 9½ × 6, pp. 20. *Price* 1½*d.*

Since 1885 the population has increased from 516 to 671, but a much larger increase is needed to make the islands independent of the outside labour market.

Indian Ocean—Maldive Islands. *American J. Sci.* 13 (1902): 297–308. **Agassiz.**

An Expedition to the Maldives. By Alexander Agassiz.

An abstract was given in the *Journal* for April (vol. xix. p. 480).

Japan—Rainfall. *J.G., Tōkyō G.S.*, 13 (1901): 405–412, 461–467. **Nakagawa.**

On the Precipitation in the Japanese Islands. By Gensaburo Nakagawa. [In Japanese.]

Malay Archipelago—Borneo. *B.G.S. Philadelphia* 3 (1901): 51–64. **Hiller.**

Manners and Customs of the People of Southern Borneo. By H. M. Hiller. *With Illustrations.*

Malay Archipelago—Borneo. ——

Tijds. K. Ned. Aard. Genoots. Amsterdam 19 (1902): 414–416.

Bij de kaart van het Boven-Mahakâm-gebied. *With Map.*

The map, based on the work of Dr. Nieuwenhuis, shows the upper basin of the Mahakam.

Malay Archipelago—Celebes. **Rijn.**

Tijds. K. Ned. Aard. Genoots. Amsterdam 19 (1902): 328–372.

Tocht naar de Boven-Sadang (Midden-Celebes). Door A. P. van Rijn. *With Map.*

The Sadang enters the Strait of Macassar just north of 4° S.

Malay Peninsula. *J.S. Arts* 50 (1902): 570–587. **Smyth.**

Boats and Boat Building in the Malay Peninsula. By H. Warington Smyth. *With Illustrations.*

Malay Peninsula—Zoology. **Laidlaw and Skeat.**

P. Zoolog. S. 1901 (2) (1902): 575–586.

List of a Collection of Snakes, Crocodiles, and Chelonians from the Malay Peninsula, made by members of the "Skeat Expedition," 1899–1900. By F. F. Laidlaw, B.A. With an Appendix containing a list of the names of the places visited by the "Skeat Expedition." By W. W. Skeat. *With Plate.*

The appendix is of geographical interest as a guide to the true forms and pronunciation of Malayan place-names. As regards the system of orthography adopted, it could have been wished that *a* and *ai* had been used instead of *ĕ* and *ei* for the "indeterminate" vowel sound (*a* in "machine") and the English long *i* respectively.

Perim Island. *Geolog. Mag.* 9 (1902): 206–210. **Raisin.**

Notes on the Geology of Perim Island. By Catherine A. Raisin, D.SC. *With Section.*

Perim Island. *Rep. B. Assoc.* (1901): 640–641. **Raisin.**

Perim Island and its Relations to the Area of the Red Sea. By Catherine A. Raisin, D.SC.

Persia. *Z. Ges. Erdk. Berlin* (1902): 99–111. **Sarre.**

Reise in Mazenderan (Persien). Von Dr. F. Sarre. *With Illustrations.*

The journey was made in 1899, mainly for the study of the architectural monuments of the country.

Persia. **Sykes.**

Ten Thousand Miles in Persia or Eight Years in Irán. By Major Percy Molesworth Sykes. London: John Murray, 1902. Size 9½ × 6½, pp. xvi. and 482. *Map and Illustrations. Price 25s. net. Presented by the Publisher.*

This was reviewed in the July *Journal* (p. 92).

Philippine Islands. ——

Report of the Philippine Commission to the President. 4 vols. (Vol. i. pp. viii.

and 266); (vol. ii. pp. viii. and 496); (vol. iii. pp. 444); (vol. iv. pp. 418.) Washington, 1900–1901. Size 10 × 6. *Maps and Illustrations.*

Vol. i. deals especially with methods of government (past and prospective) in the Philippines; vol. ii. consists of the testimony given by witnesses before the Commission; and the bulk of vols. iii. and iv. is made up by a translation and adaptation of the papers prepared by the Jesuits of Manila, and already published in full in Spanish (cf. *Journal*, vol. xix. p. 619). There are, however, some additional papers, *e.g.* one by G. F. Becker on "Mineral Resources and Geology."

Russia—Caucasus. ——

Collection of Material for the description of Places and Tribes of the Caucasus. [xxix.] Tiflis, 1901. Size 9½ × 6½, pp. x., 148, 220, 96, 4, 162, and 62.

Russia—Siberia. *B.S.G. Com. Paris* **23** (1901): 514–529. **Labbé.**

La Situation des Provinces traversées par le Transsibérien. Par M. Paul Labbé.

Russia—Siberia. *Zap. Imp. Russ. G.S.*, Statist. Sec., **10** (1901): 1–366. **Plotnikoff.**

The Narim Country. Historical-Statistical Sketch. [A. F. Plotnikoff.] [In Russian.] *With Map.*

See note in the May *Journal* (p. 635).

Russia—Siberia and Manchuria. **Fraser.**

The Real Siberia; together with an account of a dash through Manchuria. By John Foster Fraser. London: Cassell & Co., 1902. Size 8 × 5, pp. xvi. and 280. *Map and Illustrations. Presented by the Publishers.*

This book, which records the personal impressions gained during a journey made last year across Siberia and Manchuria, aims at presenting to the general reader a picture of Siberia as it now is, since the period of modern development was ushered in by the advent of the railway. The author, who was reminded everywhere of Canada and the best parts of Western America, looks upon Siberia as the great food-producing region of the future.

Siam. *Rep. B. Assoc.* (1901): 411–424. **Skeat.**

Second Report on Cambridge Exploring Expedition to the Malay Provinces of Lower Siam, drawn up by W. W. Skeat.

Siam—Surveys. ——

Siam. General Report on the Operations of the Royal Survey Department, Season 1900–1901. Bangkok: Printed at "The American Presbyterian Mission Press," 1901. Size 13 × 8½, pp. 60. *Map, Plates, and Diagrams. Presented by the Royal Survey Department, Bangkok, Siam.*

Tibet—Flora. *J. Linnean S., Botany* **35** (1902): 124–265. **Hemsley.**

The Flora of Tibet or High Asia; being a Consolidated Account of the various Tibetan Botanical Collections in the Herbarium of the Royal Gardens, Kew, together with an Exposition of what is known of the Flora of Tibet. By W. Botting Hemsley, assisted by H. H. W. Pearson. *With Map. Also separate copy presented by the Author.*

This is noticed in the Monthly Record.

Turkey. *Globus* **81** (1902): 181–185. **Immanuel.**

Die Bagdadbahn. Ein deutsches Kulturwerk in Asien. Von Hauptmann Immanuel. *With Map.*

Turkey. *M.K.K.G. Ges. Wien* **45** (1902): 15–17. **Schaffer.**

Die Bagdadbahn. Von Dr. Franz Schaffer.

Turkey—Babylonia. **Wagner.**

Die Ueberschätzung der Anbaufläche Babyloniens und ihr Ursprung. Methodische Bedenken von Hermann Wagner. (Aus den Nachrichten der K. Gesellschaft der Wissenschaften zu Göttingen. Philologisch-Historische Klasse. 1902. Heft 2.) Size 9½ × 6½, pp. 224–298. *Maps.*

Turkey—Palestine. **Masterman.**

Palestine Exploration Fund, Quarterly Statement (1902): 160–167.

'Ain el-Feshkhah, el-Ḥajar, el-Aṣbah, and Kh. Ḳumrân. By Dr. E. W. G. Masterman. *With Map and Illustrations.*

Turkey—Palestine—Dead Sea. **Masterman.**
Palestine Exploration Fund, Quarterly Statement (1902): 155–160.
Observations of the Dead Sea Levels. By Dr. E. W. G. Masterman.

This is noticed in the Monthly Record for July.

Turkey—Syria. **Bliss.**
Palestine Exploration Fund, Quarterly Statement (1902): 168–175.
The German Excavations at Ba'albek. By F. J. Bliss, PH.D. *With Plan and Illustration.*

AFRICA.

Africa—Railways. *Export* **24** (1902): 197–199, 209–210, 221–223, 233–234. ——
Das tropische Afrika und Seine Eisenbahnen.

Algerian Sahara. *B.S.G. Marseille* **25** (1901): 267–273. **Lahache.**
Le Gouffre d'Aïn-Taïba, Sahara. Par le Dr. J. Lahache. *With Map.*

The Ain-Taiba is the only known source of water-supply, above ground, in the eastern region of dunes, south of Algeria.

Azores. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **19** (1902): 235–265. **Verschuur.**
De Azorische eilanden. Door G. Verschuur.

Account of a visit to the group.

British East Africa—Murchison Falls. *Nature* **66** (1902): 188–189. **Betton.**
The Murchison Falls. By C. Steuart Betton.

British East Africa—Ruwenzori. *Alpine J.* **21** (1902): 77–90. **Moore.**
First Ascent of one of the Snow Ridges in the Mountains of the Moon. By J. E. S. Moore. *With Illustrations.*

Central Africa. *Deutsch. Koloniulzeitung* **19** (1902): 231–232, 245–246. **Schwartz.**
Eine Besteigung des Vulkans Kirunga tscha Niragongwe. Von W. Schwartz.

This will be noticed in the Monthly Record.

Central Africa. *J. African S.* (1902): 358–367. **Spilsbury.**
The Development of Central Africa from the East. By Major A. Gybbon Spilsbury.

Central Africa—Lake Kivu. **Bockelmann.**
Beiträge Kolonialpolitik u. Kolonialwirtschaft **3** (1901–1902): 357–380.
Versuch einer Monographie des Kiwu-Sees und seiner Umgebung als Begleittext zu Dr. Kandt's Karte. Von A. V. Bockelmann. *With Map.*

See note in the July *Journal* (p. 103).

Central Africa—Lakes. *P. Zoolog. S.*, 1901 (2) (1902): 461–470. **Moore.**
Further Researches concerning the Molluscs of the Great African Lakes. By J. E. S. Moore. *With Plates.*

Central Sudan. *Globus* **81** (1902): 373–375. **Singer.**
Die Dreiländerecke am Tschadsee. Eine Kolonialpolitische Betrachtung. Von H. Singer.

Congo State. **Lemaire.**
Mission Scientifique du Ka-Tanga. Observations altimétriques. Note sur les déterminations d'altitude. Tableau définitif des altitudes déterminées du mois d'août 1898 au mois de mai 1900. Table unique pour le calcul des altitudes de 0 mètre à 2100 mètres, dans les régions comprises entre 12° de latitude Nord et 12° de latitude Sud. Par le Capitaine Lemaire Charles. Seizième Mémoire. Size 13 × 10, pp. 56. *Presented by the Author.*

This will be specially noticed.

East Africa. *M.K.K.G. Ges. Wien* **45** (1902): 22–24. **Wickenburg.**
Reise des Grafen Wickenburg.

A short account of the journey was given at p. 216 of vol. xix. of the *Journal.*

Egypt—Cairo. **Lane-Poole.**
The Story of Cairo. By Stanley Lane-Poole. London: J. M. Dent & Co., 1902. Size 7 × 4½, pp. xx. and 340. *Map and Illustrations. Price 4s. 6d. net. Presented by the Publishers.*

One of a most tastefully got-up series of little volumes on famous mediæval towns. It is embellished by reproductions of old drawings (with some modern ones), which are a decided help towards realizing the aspect of the city before the advent of modern influences. The name of the author is a guarantee of the accuracy and interest of the text, which is both descriptive and historical. A table of the rulers and monuments of Cairo is given at the end, and another for the conversion of Mohammedan dates into those of the Christian era.

Egypt—Nile. *C. Rd.* 134 (1902): 1091–1092. **Lortet and Hugounenq.**
Coloration noire des rochers formant les cataractes du Nil. Note de MM. Lortet et Hugounenq.

Eritrea. *Ann. G.* 11 (1902): 153–168. **Saint-Yves.**
A travers l'Erythrée Italienne, les confins de l'Abyssinie et du Soudan. Par G. Saint-Yves.

French Congo. *B.S.G. Com. Paris* 23 (1901): 489–513. **Bobichon.**
La colonisation du Haut-Oubangui. Par M. Henri Bobichon.

French Congo. *La G., B.S.G. Paris* 5 (1902): 216–218. **Julien.**
Exploration du capitaine Julien de la haute Banghi à la Yéouka et le long de l'Oubanghi.

French West Africa. *La G., B.S.G. Paris* 5 (1902): 165–174. **Bruel.**
La région civile du Haut-Chari. Par G. Bruel. *With Map.*

French West Africa. *La G., B.S.G. Paris* 5 (1902): 155–164. **Robillot.**
Reconnaissance et organisation du Bas-Chari. Par Commandant Robillot.

Ivory Coast. *B.S.G. Lyon* 17 (1902): 632–643. **Cassel.**
La Haute Côte d'Ivoire Occidentale. Conférence par M. van Cassel.

Ivory Coast. *La G., B.S.G. Paris* 5 (1902): 241–246. **Clozel.**
Jonction des lagunes d'Assinie et de Grand-Bassam, Côte d'Ivoire. Par M. Clozel. *With Map.*

The writer's survey of the coast-region between Assini and Grand-Bassam has shown the feasibility of the connection of the lagoons by a navigable channel.

Kamerun. *Deutsch. Kolonialblatt* 13 (1902): 215–218. **Stein.**
Expedition des Freiherrn v. Stein. *With Map.*

Continues the account of the return journey to the Ngoko station (cf. *Journal*, vol. xix. pp. 218, 638).

Komoro Islands. *B.S.G. Com. Paris* 23 (1901): 579–606. **Repiquet.**
Le Sultanat d'Anjouan, une de nos colonies de la côte de Mozambique. Par M. J. V. Repiquet. *With Map.*

Madagascar. ——
Madagascar au début du XX^e Siècle. Paris: F. R. de Rudeval et Cie., 1902. Size 10 × 6½, pp. vi. and 466. *Maps and Illustrations. Price 20 fr. Presented by the Publishers.*

This will be reviewed elsewhere.

Morocco. *Fortnightly Rev.* 71 (1902): 675–681. **Mackenzie.**
Morocco and the European Powers. By Donald Mackenzie.

Sahara. *C. Rd.* 134 (1902): 1322–1324. **Flamand.**
Sur la présence du Dévonien inférieur dans le Sahara occidental (Bas-Touat et Tidikelt, archipel touatien). Note de M. G. B. M. Flamand.

Transvaal—Geology. *La G., B.S.G. Paris* 5 (1902): 196–200. **Giraud.**
La Géologie du Transvaal. Par J. Giraud.

Based on Dr. Molengraaff's work (see below).

Transvaal—Geology. **Molengraaff.**
Géologie de la République Sud-Africaine du Transvaal. Par le Dr. G. A. F. Molengraaff. (Extrait du Bulletin de la Société Géologique de France.) Paris, 1901. Size 10 × 6½, pp. 92. *Map and Illustrations.*

The most complete account of the Geology of the Transvaal that has yet appeared. The author, whose geological explorations in Borneo are well known, was director of the Geological Survey of the Transvaal before the war, and has also given a summary of the geology of the country in the official report entered below.

Transvaal—Geology. **Molengraaff.**
Geological Survey of the South African Republic. Annual Report for the year

1898. By Dr. G. A. F. Molengraaff. [Translated from the Dutch.] Pretoria, 1902. Size 13 × 8½, pp. 46. *Maps and Sections.*

NORTH AMERICA.

Alaska. **Burroughs, Muir, Grinnell, and others.**

Alaska. Giving the results of the Harriman Alaska Expedition, carried out with the co-operation of the Washington Academy of Sciences. 2 vols. Vol. i. Narrative, Glaciers, Natives. By John Burroughs, John Muir, and George Bird Grinnell. Vol. ii. History, Geography, Resources. By William H. Dall, Charles Keeler, Henry Gannett, William H. Brewer, C. Hart Merriam, George Bird Grinnell, and M. L. Washburn. London: John Murray, 1902. Size 10½ × 7, pp. xl. and 384. *Maps, Plates, and Illustrations. Price £3 3s. 0d. net.*

This will be the subject of a special review.

Lake Erie. **Henry.**

Wind Velocity and Fluctuations of Water Level on Lake Erie. Prepared . . . by Prof. Alfred J. Henry. (U.S. Department of Agriculture, Weather Bureau, Bulletin J.) Washington, 1902. Size 11½ × 9½, pp. 22. *Chart and Diagrams. Presented by the U.S. Department of Agriculture.*

This was noticed in the Monthly Record for July.

United States. ——

U.S. Department of Agriculture, Weather Bureau. Report of the Chief of the Weather Bureau, 1899–1900. Washington, 1901. Size 12 × 9, pp. 436.

United States. ——

Annual Report of the Department of the Interior, 1899 [7 vols.]:—Report of the Secretary of the Interior. Report of the Commissioner of the General Land Office (1899, pp. cxlii. and 536); Indian Affairs, 2 vols. (1899, pp. — vol. i., viii. and 682; vol. ii., 750. *Maps and Illustrations*); Miscellaneous Reports, 2 vols. (1899, pp. — vol. i., 576; vol. ii., 882. *Plans and Illustrations*); Report of the Commissioner of Education, 2 vols. (1900, pp. xcii. and 2518. *Illustrations*). Size 9 × 6. Washington. *Presented by the U.S. Department of the Interior.*

United States—Arkansas. *J. Geology* 10 (1902): 160-165. **Hershey.**

Boston Mountain Physiography. By Oscar H. Hershey.

United States—Census. **Hunt.**

Census Reports. Volume i. Twelfth Census of the United States, taken in the year 1900. William R. Merriam, Director. Population, Part i. Prepared under the supervision of William C. Hunt, Chief Statistician for Population. Washington: United States Census Office, 1901. Size 12 × 9½, pp. ccxx. and 1006. *Maps and Diagrams. Presented by the Director of the Census.*

The present part, which constitutes vol. i. of the census reports, treats of the population both in the aggregate and in detail by sex, general nativity, colour, place of birth, parentage, citizenship, and years in the United States. It has been completed and published in the short space of eighteen months since the enumeration was taken. The population report will be completed in a second volume.

United States—Food Production. **Atkinson.**

Food and Land Tenure. By Edward Atkinson. [Reprinted, with additions, from the *Popular Science Monthly*, October, 1901, vol. lix., No. 6.] Size 10 × 7, pp. 32.

The writer holds that "the theory that wheat-bread may be wanting during the present century for lack of land is absolutely unthinkable."

United States—Genesee River. *B. American G.S.* 34 (1902): 32-44. **Whitbeck.**

The Preglacial Course of the Middle Portion of the Genesee River. By R. H. Whitbeck. *With Map and Illustrations.*

United States—Geological Survey. ——

Annual Reports of the Department of the Interior for the fiscal year ended June 30, 1899. Twentieth Annual Report of the United States Geological Survey. Part i.—Director's Report, including Triangulation and Spirit Levelling. (Pp. 552. *Maps.*) Ditto. Part vi. (in 2 vols.). Mineral Resources of the United States, 1898. (Pp. 616 and 804. *Plate.*) Washington, 1899. Size 11½ × 8. *Presented by the U.S. Geological Survey.*

United States—Indiana. *J. Geology* 10 (1902): 166-181. **Newsom.**
Drainage of Southern Indiana. By J. F. Newsom. *With Map.*

United States—Klamath Mountains. *J. Geology* 10 (1902): 144-159. **Anderson.**
The Physiographic Features of the Klamath Mountains. By F. M. Anderson.

United States—Magnetic Survey. *National G. Mag.* 13 (1902): 92-95. **Bauer.**
Magnetic Survey of the United States. By Dr. L. A. Bauer. *With Chart.*

United States—Massachusetts. *P. Boston S. Nat. Hist.* 30 (1901): 353-374. **Wilson.**
The Medford Dike Area. By Alfred W. G. Wilson. *With Maps.*

United States—Negroes. **Atkinson.**
The Race Problem: its possible solution. By Edward Atkinson. Reprinted from Manufacturers' Record of Baltimore, of December 19, 1901. Size 9½ × 6, pp. 8.

The writer considers that the race-problem in the United States exists only where there is much illiteracy among both whites and blacks.

CENTRAL AND SOUTH AMERICA.

Central America—Interoceanic Routes. **Morrison.**
Library of Congress. List of Books and of Articles in Periodicals relating to Interoceanic Canal and Railway Routes (Nicaragua; Panama, Darien, and the Valley of the Atrato; Tehuantepec and Honduras; Suez Canal). By Hugh A. Morrison, jr. With an Appendix: Bibliography of the United States Public Documents. Washington, 1900. Size 9½ × 6, pp. 174.

Colombia. *Jahresb. G. Ges. München* (1900-1901): lxii.-lxv. **Regel.**
Ueber seine Reisen im Berglande von Antioquia (Kolumbien). Von Prof. Dr. F. Regel.

Guiana. *Petermanns M.* 48 (1902): 58-66. **Sievers.**
Der Grenzstreit zwischen Brasilien und Frankreich über Guayana. Von Prof. Dr. W. Sievers. *With Map.*

Patagonia. *Norske G. Selsk. Aarbog* 12 (1900-1901): 67-78. **Schjander.**
Fra det indre af Patagonien. Af Afdelings-Chef Nils Schjander.

Peru. *B.S.G. Lima* 11 (1901): 212-219. **Duval and Quartel.**
Ferrocarril de Paita al Marañón. Por A. Duval y Pedro J. de Quartel.

Peru. *Norske G. Selsk. Aarbog* 12 (1900-1901): 50-66. **Markham.**
Geographical Aspects of Inca Civilization. Af Sir Clements Markham.

A paper read at the Norwegian Geographical Society in 1900, tracing the influence of geographical conditions on the inhabitants of Peru.

Peru. *B.S G. Lima* 11 (1901): 164-174. **Raéz.**
Itinerario de Huancayo á Lunahuaná. Por Nemesio A. Raéz.

South America. *Norske G. Selsk. Aarbog* 12 (1900-1901): 79-95. **Martens.**
Fra det indre af Syd-Amerika, af Yngvar Martens. *With Illustration.*

Deals chiefly with the "Guayaquil" Indians of the borders of Argentina, Paraquay, and Brazil.

AUSTRALASIA AND PACIFIC ISLANDS.

Pacific Ocean—Cable. **Clark, Ford, and Taylor.**
Pacific Cable. Engineers' Report on the Selection of Landing Places, Sites for Stations, etc., and on the Survey of the Route for the Cable. Size 15½ × 11, pp. 98. *Charts and Illustrations. Presented by the Authors.*

This report contains as an appendix the complete log of the soundings taken during Mr. Peake's survey, the chief scientific results of which were summarized by Sir John Murray in the June number of the *Journal.*

Queensland. **Jack.**
Artesian Water in the State of Queensland, Australia. By Dr. R. Logan Jack. (Read before the Victoria Institute.) 1902. Size 8½ × 5½, pp. 16. *Diagram. Presented by the Author.*

Savage Island. **Thomson.**

Savage Island, an Account of a Sojourn in Niué and Tonga. By Basil Thomson. London: John Murray, 1902. Size 8½ × 5½, pp. viii. and 234. *Map and Illustrations. Price 7s. 6d. net. Presented by the Publisher.*

Mr. Thomson went officially to Niue in 1900, when negotiating a British Protectorate over Tonga, and in the present work supplies a welcome addition to our knowledge of that rarely visited island.

South Australia—Meteorology. **Todd.**

1897. Meteorological Observations made at the Adelaide Observatory and other places in South Australia and the Northern Territory during the year 1897, under the direction of Charles Todd. Adelaide: C. E. Bristow, 1900. Size 13 × 8½, pp. xiv. and 78. *Maps.* Ditto during the year 1898. Pp. xvi. and 82. *Maps. Presented by the Government Astronomer.*

Tasmania. *Rev. of Reviews, Australasia* 18 (1901): 199–220. **Shum and Ussher.**

Tasmania at the Beginning of the Century. By W. A. Shum and Lancelot H. Ussher. *With Illustrations.*

Victoria—Statistics. **Fenton.**

Victorian Year-Book, 1895–8. Containing a Digest of the Statistics of Victoria, with references to the Statistics of the other Australasian Colonies and other Countries. By J. J. Fenton. Melbourne: R. S. Brain; London: Paul & Co., 1901. Size 8½ × 5½, pp. 8, xviii, ii., 1132, and cccxxvi. *Map.*

Western Australia. **Clifton.**

Western Australia. Department of Lands and Surveys. Report by the Under Secretary for Lands for the year 1900. Perth, 1901. Size 13½ × 8½, pp. 60. *Presented by the Minister for Lands, Western Australia.*

Western Australia. **Johnston.**

Western Australia. Department of Lands and Surveys. Report by the Surveyor-General for the year 1900. Perth, 1901. Size 13½ × 8, pp. 16. *Maps and Plans. Presented by the Minister for Lands, Western Australia.*

POLAR REGIONS.

Antarctic—Twilight. *Ciel et Terre* 23 (1902): 68–79. **Arçtowski.**

Note sur les phénomènes crépusculaires observés à bord de la "Belgica." Par Henryk Arçtowski.

Arctic. *A travers le Monde, Tour du Monde* 8 (1902): 109–111. **Stein.**

Deux années dans les régions arctiques.—Journal du docteur Robert Stein. *With Map.*

Arctic—Botany. *Vierteljahrs. Naturforsch. Ges. Zürich* 46 (1901): 300–322. **Rikli.**

Die pflanzlichen Formationen der Arktis. Von M. Rikli. *With Profile.*

Arctic—Norwegian Expedition. **Nansen.**

The Norwegian North Polar Expedition, 1893–1896. Scientific Results edited by Fridtjof Nansen. Vol. iii. Published by the Fridtjof Nansen Fund for the Advancement of Science. London, etc.: Longmans & Co, 1902. Size 11½ × 9, pp. xii., 428, and 88. *Maps and Diagrams. Two copies, one presented by the Fridtjof Nansen Fund, the other by Messrs. Longmans & Co.*

A review of this will be given.

Arctic—Russian Expedition. *Petermanns M.* 48 (1902): 66–68. **Toll.**

Russische Polarexpedition unter Leitung von Baron Ed. Toll. Bericht über die Fahrt der "Sarja" durch die Kara-See und über die Arbeiten des Jahres 1900. Von Eduard v. Toll.

Greenland. **Moltke.**

Meddelelser om Grønland, udgivne af Commissionen for Ledelsen af de geologiske og geographiske Undersøgelser i Grønland. Farvetrykt Bilag til Hefte XXIV. Harald Moltke: Nordkysten af Vajgat i Nord-Grønland. Kjøbenhavn: C. A. Reitzel, 1901. Size 7½ × 11.

A panorama of the coast-line.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Meteorology. **Marriott.**

Hints to Meteorological Observers. Instructions for taking Observations, and Tables for their Reduction, together with a Glossary of Meteorological terms. Prepared under the direction of the Council of the Royal Meteorological Society, by William Marriott. Fifth edition. London: E. Stanford, 1902. Size 10 × 6½, pp. 60. *Illustrations. Price* 1s. 6d.

Oceanography. *Rev. Scientifique* 17 (1902): 1-12, 40-49, 138-145. **Monaco.**

Le dernier voyage scientifique de "l'Hirondelle." Par Albert, Prince de Monaco.

Oceanography. **Townsend.**

U.S. Commission of Fish and Fisheries. Dredging and other Records of the United States Fish Commission Steamer *Albatross*, with Bibliography relative to the work of the vessel. Compiled by C. H. Townsend. (Extracted from U.S. Fish Commission Report for 1900. Pp. 387-562.) Washington, 1901. Size 9 × 6. *Charts and Plates.*

The records of observations connected with the dredging, sounding, and other scientific operations carried out on board the *Albatross* since 1883 are here brought together from the yearly reports, etc., of the United States Fish Commission. The bibliography of books and papers dealing more or less directly with the work of the *Albatross* contains over 230 entries.

Oceanography—Currents. *National G. Mag.* 13 (1902): 135-142. **Page.**

Ocean Currents. By James Page.

Oceanography—Norwegian Expedition. **Friele and Grieg.**

The Norwegian North-Atlantic Expedition, 1876-1878. XXVIII. Zoology. Mollusca iii. By Herman Friele and James A. Grieg. Chemical Examination of Shells of Mollusca and of Dried Echinoderms. By L. Schmelck. Christiania, 1901. Size 15 × 11½, pp. viii. and 128. *Maps. Presented by the Editorial Committee.*

Phyto-Geography. **Bretzl.**

Botanische Forschungen des Alexanderzuges, nach Theophrasts Auszügen aus den griechischen Generalstabsberichten. Inaugural-Dissertation . . . vorgelegt von Hugo Bretzl. Strassburg, 1902. Size 9 × 6, pp. 42. *Presented by the Author.*

The writer shows how the campaigns of Alexander, by familiarizing the Greeks with new climatic regions, gave the first impetus to the study of botanical geography.

Phyto-Geography. *Scottish G. Mag.* 18 (1902): 225-236. **Hardy.**

Botanical Geography and the Biological Utilisation of the Soil. By Marcel Hardy.

Zoogeography—Birds. *Deutsche Rundschau G.* 24 (1902): 306-310. **Floericke.**

Die Wanderungen der Vögel. Von Dr. Curt Floericke. *With Map.*

This was noticed in the Monthly Record for July.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commercial Geography—Pecan. *J.G.* 1 (1902): 102-109. **Littlejohn.**

The Pecan. Its culture and commercial value. By E. G. Littlejohn. *With Map and Illustrations.*

The pecan is the nut of *Carya olivæformis*, which is said to offer great advantages as an article of food.

Historical. *Mouvement G.* 19 (1902): 211-216, 223-227. ———

La fondation de la Compagnie d'Ostende (1723).

Les expéditions de la Compagnie d'Ostende.

Historical—Behaim. *Rep. B. Assoc.* (1901): 714-715. **Ravenstein.**

Martin Behaim of Nürnberg, 1459-1507. By E. G. Ravenstein.

Historical—Magellan. **Grifoni.**

U. Grifoni. Magellano scoprì lo stretto che porta il suo nome? (Rivista Marittima. Estratto dal fascicolo di ottobre 1901.) Roma, 1901. Size 8½ × 6, pp. 22. *Presented by the Author.*

An attempt to belittle Magellan's achievement by showing that notions as to his strait were current before his voyage.

Historical—Toscanelli and Columbus. *Ann. G.* 11 (1902): 97–110. **Gallois.**

Toscanelli et Christophe Colomb. Par L. Gallois.

A critical analysis of M. Vignaud's arguments put forward in his recent work.

Historical—Toscanelli and Columbus. **Marcel.**

La G., B.S.G. Paris 5 (1902): 267–272.

Toscanelli et Christophe Colomb d'après un ouvrage récent. Par Gabriel Marcel.

A critical examination of the thesis lately put forward by M. Vignaud.

Piracy. *Nautical Mag.* 71 (1902): 205–214. **Stephens.**

Piracy from the Thirteenth to the Eighteenth Century. By J. E. R. Stephens.

Soil. *Popular Sci. Monthly* 60 (1902): 539–550. **Cameron.**

The Soil as an Economic and Social Factor. By Frank K. Cameron.

BIOGRAPHY.

Holub. *Deutsche Rundschau G.* 24 (1902): 327–329. ——

Dr. Emil Holub. *With Portrait.*

Mushketoff. *Deutsch. Rundschau G.* 24 (1902): 280–282. **Stenin.**

Iwan Wassiljewitsch Muschketoff. Von Peter v. Stenin. *With Portrait.*

Nordenskiöld. *Ymer* 22 (1902): 109–303. **Wieselgren and others.**

Åt minnet af A. E. Nordenskiöld. *With Portrait, Maps, and Illustrations.*

Mr. Wieselgren gives a general biographical sketch of the late Baron Nordenskiöld, Dr. Nathorst deals with his polar voyages and geological work, Mr. Sjögren with the mineralogical, and Mr. Dahlgren with his researches in historical geography and cartography. A bibliography of all his published writings is added by Mr. Hulth.

Tomaschek. *M.K.K.G. Ges. Wien* 45 (1902): 3–14. **Bittner.**

Wilhelm Tomaschek. Von Prof. Dr. Maximilian Bittner.

GENERAL.

Asia and America. *Petermanns M.* 48 (1902): 49–58. **Immanuel.**

Nordwest-Amerika und Nordost-Asien. Geographische Wechselbeziehungen. Von Hauptmann Fr. Immanuel. *With Map.*

Some of the statements in this article are severely criticised in *Science* by Mr. A. H. Brooks, one of the U.S. Geological Survey explorers of Alaska.

Bibliography. **Berg.**

Die wichtigste geographische Litteratur. Ein praktischer Wegweiser von Dr. Alfred Berg. Halle a. S., Gebauer-Schwetschke Druckerei u. Verlag, 1902. Size 8½ × 5½, pp. 76. *Presented by the Publisher.*

Being intended chiefly for German readers, the number of books in other languages referred to is extremely limited. Thus, under Sahara, no mention is made of Schirmer's work.

Coins. **Macdonald.**

Catalogue of Greek Coins in the Hunterian Collection, University of Glasgow. Volume ii. North-Western Greece, Central Greece, Southern Greece, and Asia Minor. By George Macdonald. Glasgow: J. Maclehose & Sons, 1901. Size 12 × 9, pp. viii. and 650. *Plates. Presented by the Publishers.*

Educational. *Z. Ges. Erdk. Berlin* (1902): 112–142. **Fischer.**

Zur Methodik des erdkundlichen Schulunterrichts. Von H. Fischer.

Education—Text-books. **Wölfel.**

Bemerkungen zu geographischen Lehr- und Schulbüchern, Karten, etc. Von Dr. Phil. E. J. Wölfel. Freiberg: Gerlachsche Buchdruckerei, 1902. Size 10 × 8, pp. 32. *Presented by the Author.*

German Colonies. **Buchanan.**

Report on German Colonies for the year 1900–1901. Foreign Office, Annual No. 2790, 1902. Size 9½ × 6, pp. 30. *Price 2d.*

Local Geography. *Eastern Counties Mag.* 2 (1902): 329–334. **Mill.**

The Study of Local Geography. By Dr. H. R. Mill.

Malaria. **Stephens and Christophers.**

Reports to the Malaria Committee of the Royal Society. Sixth Series. Reports from Messrs. Stephens and Christophers, Bengal. London: Harrison & Sons, 1902. Size 8½ × 5½, pp. 24. *Maps, Plans, and Illustrations. Price* 1*s. Presented by the Royal Society.*

See note in the June *Journal* (p. 753).

North America and Asia. *National G. Mag.* **13** (1902): 86–92. **Baker.**

Sarichef's Atlas, 1826. By Marcus Baker.

Royal Society—Year-Book. ——

Year-Book of the Royal Society of London, 1902. London: Harrison & Sons, 1902. Size 8½ × 5½, pp. 266. *Presented by the Royal Society.*

Science and Time. **Ratzel.**

Die Zeitforderung in den Entwickelungswissenschaften. (Abgedruckt aus Ostwald's Annalen der Naturphilosophie Erster Band.) Leipzig: Veit & Comp. Size 9 × 6, pp. 309–363. *Presented by the Author.*

The writer regards the sciences which deal with development as bound together by their common relation to time, the determination of which is their primary task. Among them he lays stress on the distinction between sciences based on time-reckoning and those based on mere estimates of time.

Steamship Guide. **Rhodes.**

1902–3. Rhodes's Steamship Guide. Edited by Thomas Rhodes. London: G. Philip & Son. Size 7 × 5, pp. 494. *Illustrations. Price* 2*s. Presented by the Publishers.*

Contains a large amount of practical information for intending voyagers, though not quite complete as regards the means of communication with some of the more remote ports, especially in the Pacific. The Gazeteer of Ports does not always give the necessary references. Thus no clue is to be found to the information on p. 126 as to the Belgian steamers to the Congo.

Year-Book. **Klein.**

Jahrbuch der Astronomie und Geophysik. Enthaltend die wichtigsten Fortschritte auf den Gebieten der Astrophysik, Meteorologie und physikalischen Erdkunde. Unter Mitwirkung von Fachmännern herausgegeben von Dr. Hermann J. Klein. XII. Jahrgang, 1901. Leipzig: E. H. Mayer, 1902. Size 9 × 5½, pp. viii. and 416. *Maps and Illustrations.*

Year-Book.' **Wagner.**

Geographisches Jahrbuch. XXIV. Band, 1901 . . . herausgegeben von Hermann Wagner. Zweite Hälfte. Gotha: Justus Perthes, 1902. Size 8½ × 6, pp. 249–444. *Price* 7.50 *m.*

This part is devoted mainly to recent work in the geography of plants and animals, but includes also a useful report by Hauptmann Kollm on the geographical societies of the world, supplementing that issued in 1896.

NEW MAPS.

By E. A. REEVES, *Map Curator,* **R.G.S.**

EUROPE.

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from June 1 to 30, 1902.

1-inch:—

Towns and country around, or districts, with lakes and roads printed in colour. The Lake District, West. 1*s.* 6*d.*

6-inch—County Maps:—

Cambridgeshire, 14 S.W., S.E., 19 N.E., 20 N.W., S.W. **Huntingdonshire,** 1 (N.E. and S.E.), 2 S.W., 4 S.E., 5 N.W., N.E., S.E., 6 S.W., S.E., 9 N.E., S.W., S.E., 10 N.E., S.W., S.E., 11 N.W., S.W., 12 N.E., 13 N.W., S.W., S.E., 14 N.W., N.E., 15 N.W., 16 N.E., 17 N.E., S.W., S.E., 18 N.W., S.W., S.E., 19 N.W., 20 N.E., 21 S.W., 22 N.W., 24 N.E., 25 N.W., S.W. **Monmouthshire,** 1 S.E., 6 S.E., 12 S.E., 28 N.E., 29 S.W., 35 N.W. (35 N.E. and 36 N.W.), 35 S.W. (36 N.W. and 35 N.E.). **Wiltshire,** 74 S.W. 1*s. each.*

25-inch—County Maps:—

Cambridgeshire, I. 14; XXII. 5, 7; XXV. 8, 15. **Dorsetshire,** XXXI. 3, 8; XXXII. 6, 13, 14; XLI. 1, 9, 15; XLVIII. 3, 8, 11, 12; XLIX. 6, 14; LIV. 2, 3; LV. 2. **Gloucestershire,** IX. 4, 8. 16; X. 5, 9, 10, 13, 14; XI. 10, 11, 15 16; XII. 7; XIX. 8, 9, 13; XX. 13; XXV. 14; XXX. 16; XXXV. 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13; XXXVII. 10. **Montgomeryshire,** XXIII. 8, 9, 13; XXIV. 1, 2; XXIX. 10, 11, 12, 13; XXXVI. 3, 5, 7. **Shropshire,** XXXI. 14, 15; XXXII. 16; XXXIII. 14; XXXIV. 2, 4, 5, 8; XXXV. 9; XXXVII. 1, 2, 3, 5, 6; XXXIX. 2, 3, 4, 7, 8, 11, 12; XL. 1, 3, 5. **Staffordshire,** L. 1, 2, 6, 9, 10, 14; LI. 7, 8. 9, 12, 14; LII. 5, 13; LIX. 3, 5, 6. **Worcestershire,** LIV. 9 (Areas of Eldersfield, Pendock (Det.) and Redmarley D'Abitôt Parishes only), 10 (Areas of Eldersfield and Pendock (Det.) Parishes only), 15, 16 (Area of Chaceley Parish only); LV. 7. **Yorkshire,** CCXCVI. 16; CCXCIX. 8; CCCI. 1. 3*s. each.*

4 miles to 1 inch:—

District Maps:—With roads printed in colour (Northampton), 1*s.*, folded in cover or flat in sheets.

(E. Stanford, London Agent.)

Austria. **Petermanns Geographische Mitteilungen.**

Kartenskizze der Umgebung des Fadingersattels. Scale 1 : 75,000 or 1·1 stat. miles to an inch. *Petermanns Geographische Mitteilungen,* Jahrgang 1902. Tafel 11. Gotha: Justus Perthes. *Presented by the Publisher.*

ASIA.

Japan. **Japanese Government.**

Government Survey of Japan. Scale 1 : 50,000 or 0·08 stat. miles to an inch. The Survey Department, Tokio. *Presented by K. Otani, Esq., Tokio.*

These sheets of the Japanese Survey include areas from 60 to 70 miles to the north and west of Kioto. Relief is shown by an elaborate system of contour lines, and a considerable amount of detail is given. The lettering is in native characters.

Korea. **Ministry of Finance, St. Petersburg.**

Map of Korea. Scale 1 : 355,000 or 21·2 stat. miles to an inch. Ministry of Finance, St. Petersburg, 1900. In Russian character. A. Ilyin, St. Petersburg.

This map has been compiled from the latest material up to the date of its issue. It is printed in colours—hills brown, water blue, boundaries red and green, and lettering black. In addition to the principal map there are five insets of ports, bays, etc., and a small-scale geological map of Korea.

Tibet. **Koslow.**

Schematische Darstellung der Reiseroute Koslows im östlichen Tibet, 1900. Scale 1 : 3,500,000 or 55·2 stat. miles to an inch. *Petermanns Geographische Mitteilungen,* Jahrgang 1902. Tafel 13. Gotha: Justus Perthes. *Presented by the Publisher.*

AFRICA.

Africa. **Intelligence Division, War Office.**

Africa. Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. Sheets: 63, Yola; 68, North-West Somaliland. 1901. *Price* 2*s. each.* London: Intelligence Division, War Office. Stanford. *Presented by the Director-General of Mobilization and Military Intelligence.*

Congo Free State—Lake Kivu. **Kandt.**

Karte des Kiwu Sees. Von Dr. R. Kandt. Scale 1 : 285,000 or 4·4 stat. miles to an inch. Berlin: Wilhelm Süsserott, 1902.

This map of Lake Kivu is reduced from the recent surveys of Dr. R. Kandt, concerning which various notes have appeared in the *Geographical Journal* during the last two or three years. Although differing in detail, the map agrees fairly well, as regards its general features, with the survey of the lake made in 1899–1900 by Mr. M. Fergusson, of Mr. Moore's expedition. The principal differences are noticeable in the bays and indentations of the shore-line, and in the form and direction of the large island of Kwijwi. No soundings are given, nor is there any indication of latitude and longitude. The text, by A. von Bockelmann, which accompanies the map is principally an account of the explorations of other travellers, and of the general physical features and characteristics of the neighbourhood. It would have been well if fuller information had been given as to the method of survey.

German East Africa. **Sprigade and Nobiling.**

Karte von Deutsch-Ostafrika. Scale 1 : 300,000 or 4·7 stat. miles to an inch. Sheet F 6 Kilwa. Bearbeitet von P. Sprigade, gezeichnet von H. Nobiling. Berlin : D. Reimer (Ernst Vohsen), 1901.

The area included in this sheet of the large-scale map of German East Africa extends from 8° 30′ to 10° S. lat., and from 38° to 40° E. long. Apart from the country in the neighbourhood of the coast, very little of this district is explored or at all properly mapped. The sheet is accompanied by letterpress, giving a list of the authorities from which it has been compiled.

AMERICA.

United States. **Rand, McNally & Co.**

Indexed County and Township Pocket Map of Iowa, Scale 1 : 823,680 or 13 stat. miles to an inch; Kansas, Scale 1 : 1,013,760 or 16 stat. miles to an inch ; Kentucky, Scale 1 : 1,140,480 or 18 stat. miles to an inch. Chicago and New York : Rand, McNally & Co. *Price $0.25 each. Presented by the Publishers.*

These are new editions of Rand, McNally & Co.'s useful series of maps of the United States.

West Indies—Martinique. **Petermanns Geographische Mitteilungen.**

Martinique. Nach der offiziellen französischen Karte in 1 : 80,000 reduziert auf den Massstab 1 : 200,000 or 3·1 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1902. Tafel 12. Gotha : Justus Perthes. *Presented by the Publisher.*

GENERAL.

World. **Bartholomew.**

Atlas for South African Schools. A new series of physical and political maps. By J. G. Bartholomew, F.R.G.S. Fourth and enlarged edition. Cape Town, Bulawayo, and Paarl : T. Maskew Miller.

This is a new and enlarged edition of a general atlas which was prepared some years ago at the suggestion of Dr. Muir, the Superintendent-General of Education for Cape Colony. Recent events in South Africa have rendered considerable alterations necessary, although even now no attempt has been made to show the new frontier of Natal. In its present form the atlas consists altogether of forty-eight sheets of maps, of which thirteen have special reference to South Africa. The maps of the continents are in pairs—physical and political—on the same scale, and facing each other. There are six sheets devoted to the world as a whole, illustrating physical features, meteorology, and distribution of the human race.

World. **Berndt.**

Die Concurrenz-Verhaltnisse am Weltmarkt. Percentueller Antheil der bedeutendsten Handelsstaaten am Gesammt-Handel aller Länder der Erde. Auf Grund officieller Daten nach dem Durchschnitt der letzten 3 Jahre dargestellt von Wilhelm Berndt. Wien : G. Freytag & Berndt.

This sheet measures about 27 × 35 inches, and its centre is occupied by a large general map of the world on Mercator's projection, showing steamer routes with distances in time between the principal ports, important railways, and, by means of figures, the amount of the imports and exports of each country. These figures are clearly printed in blue upon or near the various countries, in the form of a vulgar fraction, of which the numerator represents the imports, and the denominator the exports. In addition to this general map there are six small insets of the world, also on Mercator's projection, showing, by means of different tints, the percentage of the trade of the United States and some of the more important European countries to the whole trade of the world. The European countries represented are Great Britain, Germany, Netherlands, France, and Austria-Hungary. The information has been obtained from the official reports of the last three years, and altogether the map is most instructive, and will prove useful in the study of commercial geography.

World. **Freytag.**

G. Freytag : Export-Atlas für Welthandel und Industrie. Statistische Darstellung der Ein-und Ausfuhr aller wichtigen Handelsartikel nach ihrem Werte nebst den Konsular-Vertretungen des Deutschen Reichs und Österreich-Ungarns.

Herausgegeben mit Unterstützung des k. k. österr. Handelsmuseums in Wien. Vienna: G. Freytag & Berndt. *Price* 6 *m.* 50 *pf.*

A most instructive little general commercial atlas, showing by means of maps and diagrams the imports and exports of all important trade articles, together with their value, as well as the places where German and Austro-Hungarian consuls and vice-consuls are located in various parts of the world. The map of each country dealt with occupies the centre of the sheet, and around this is arranged a series of diagrams, showing by means of various colours and figures the value and relative importance of the exports and imports, based upon the returns for 1898. By means of red figures similar information is given for 1894, so it is easy to see at a glance the changes that have taken place in the interval. A fairly large-scale commercial map of the world is folded at the end, showing steamer routes and other information of a practical and interesting character. There is also a page of letterpress giving the authorities consulted. The atlas is published with the support of the *k. k. österr. Handelsmuseums* of Vienna.

World. **Stieler.**

Neue, neunte Lieferungs-Ausgabe von Stieler's Hand-Atlas, 100 Karten in Kupferstich, herausgegeben von Justus Perthes' Geographischer Anstalt in Gotha. 7 Lieferung. Sheets: 60 and 63. Gotha: Justus Perthes. *Price* 60 *pf.*

The two sheets contained in this part are No. 60, Arabien, and No. 63, Vorder-Indien und Inner-Asien. Both of these are on the scale of 1 : 7,500,000, and the former, in addition to Arabia, contains as insets a map of Palestine on the scale of 1 : 1,500,000 and a plan of Jerusalem on the scale of 1 : 20,000. No. 63 forms the southern half of a map of India and Central Asia, of which the northern section has recently been published. Both are new maps.

CHARTS.

Liverpool Bay. **Belam and Ashton.**

Chart of Liverpool Bay. Scale 1000 yards to an inch. Surveyed by Henry Belam, Commander R.N., of the Mersey Docks and Harbour Board, and H. G. G. Ashton, Assistant Marine Surveyor, 1900 (corrections 1901). *Presented by H. G. G. Ashton, Esq.*

Since the publication of this chart last year (see *Geographical Journal*, 1901), additional survey work has been carried on in Liverpool Bay, and fresh soundings taken, which have rendered it necessary to bring out a revised edition. The different issues of this chart will be interesting and instructive as showing the changes that take place in the position of the sandbanks and the depths of water, apart from their service to mariners for navigation purposes.

North Atlantic Ocean and Mediterranean. **Meteorological Office, London.**

Pilot Chart of the North Atlantic and Mediterranean for July, 1902. London: Meteorological Office. *Price* 6*d.* *Presented by the Meteorological Office, London.*

U.S. Charts. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for June, 1902. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

World. **U.S. Hydrographic Office.**

Tracks for full-powered steam-vessels with the shortest navigable distances in nautical miles. U.S. Hydrographic Office, Washington. Chart No. 1262. *Price* 30 *cents.*

An outline chart of the world on Mercator's projection, measuring about 24 × 44 inches, and showing in blue lines and lettering, and by an ingenious arrangement of tables, the shortest navigable tracks and distances in nautical miles between the principal ports of the world. Notwithstanding the number of lines and the great amount of information given, the chart is remarkably clear. Corrections have been made up to May 24 of the present year.

PHOTOGRAPHS.

China. **Parsons.**

Seventeen Photographs of the country between Hankau and Canton, taken by W. Barclay Parsons, Esq. *Presented by W. Barclay Parsons, Esq.*

These photographs are in continuation of those already presented by Mr. Barclay Parsons which were noticed in the *Geographical Journal* for May last. They are enlargements, and most of them are remarkably good specimens. The following are their titles :—

(1) A sail; (2) Lo-chang in Northern Kwang-tung; (3) Rowing a junk on the Pei Ho: the oarsman next to the boat is a woman; (4) The gorge of the Wu-shui in northern Kwang-tung; (5) Ping-tisiang bridge in Western Kiang-si; (6) A fine arch; (7) Three wheels for irrigation—different sizes to elevate to different levels; (8) A highway of the first class; (9) A pontoon bridge across the Lu Ho in Central Hu-nan; (10) A farmhouse in Hu-nan; (11) The line between the provinces of Hu-nan and Hu-peh, Hu-nan across the river; a remarkable bridge of stone beams; (12) A Yang-tse gunboat: (13) An old road with a paved strip in the centre for wheelbarrows, the wheels of which have worn a grove; (14) A village street; (15) Junks at Hankau (in the distance); (16) Wu-chang pagoda; (17) The Bung at Wu-chang—Chinese design and construction.

South Australia. ——

Four Photographs of the Flinders Memorial on the Bluff and Mount Lofty, Encounter Bay, South Australia. *Presented by the Royal Geographical Society of Australasia (South Australian Branch).*

An interesting set of photographs representing the memorial pillar and tablet with inscription which has recently been erected upon the summit of Mount Lofty, South Australia, to commemorate the meeting of Matthew Flinders, the explorer of the South Australian coast, with the French expedition under Baudin on April 8, 1802. As will be seen by the titles, there is also one of the Bluff, Encounter Bay, near to which the actual meeting took place, and another of the tablet with the record of the event which has been placed there. These photographs are important from an historical point of view.

(1) The Bluff, Encounter bay, from Granite island; (2) Tablet on the summit of The Bluff, Encounter bay; (3) Flinders column, Mount Lofty; (4) "Tablet" on Flinders column, Mount Lofty, March 22, 1902.

West Indies. **André.**

Twenty-seven Photographs of St. Vincent and Martinique, taken before and after the eruptions by Messrs. E. André and Felix Morin. *Presented by E. André, Esq.*

Some of these photographs accompanied Mr. André's paper in the *Geographical Journal* for last month. They vary in size and merit, but are especially interesting at the present time. The following are the titles :—

(1) Map of St. Vincent; (2) Kingstown, the capital of St. Vincent; (3) Georgetown, St. Vincent, showing thick bed of volcanic dust covering the country; (4 and 5) The Dry river, just beyond Langley Park, taken some time before the eruption, St. Vincent; (6) Panorama of the same country to-day; (7) The Soufrière from Georgetown, St. Vincent covered by smoke; whole country covered with volcanic dust; (8) Crater of the Soufrière, taken some years before the eruption, St. Vincent; (9) Street in Georgetown, St. Vincent: on the right, gallery broken in by weight of dust; (10) Appearance of vegetation: the large trees are bread-fruit trees; (11) Whale which floated ashore close to Georgetown, St. Vincent, probably killed by eruption; (12) Mountains in direction of the Soufrière, St. Vincent; (13) Ruined Waterloo Works, out of which 87 bodies were taken; (14) Dragging the dead to the trenches; (15) One of the hospitals; (16) Appearance of the country after the eruption; (17) H.M.S. *Indefatigable* bringing relief from Trinidad; (18, 19, and 20) St. Pierre, Martinique, before eruption; (21, 22, and 23) St. Pierre, Martinique, after eruption; (24) Steamer *Roraima*; (25) Women of the middle class (St. Pierre, Martinique): this interesting photograph was taken some time before the eruption, and represents the people who perished in the catastrophe; (26) Ruins of Empress Josephine's birthplace; (27) Usine Guérin, the first place destroyed by the eruption.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

The

Geographical Journal.

No. 3. SEPTEMBER, 1902. Vol. XX.

THE GEOGRAPHICAL CONDITIONS DETERMINING HISTORY AND RELIGION IN ASIA MINOR.*

By Prof. W. M. RAMSAY.

If geography be regarded as the study of the influence which the physical features and situation of a country exert on the people who live in it, then in no country can geography be studied so well as in Asia Minor. The physical features of the country are strongly marked; its situation is peculiar and unique; its history can be observed over a long series of centuries, and amid its infinite variety there is always a strongly marked unity, with certain clear principles of evolution, standing in obvious relation to the geographical surroundings.

In the first place, the Anatolian peninsula stretches like a bridge between Asia and Europe. Owing to the great barrier of the Caspian, the Caucasus and the Black Sea, all migrations between Asia and Europe must either keep the northern side, through Siberia and Russia, or the southern, along the Anatolian road. A few of the invasions of Europe by Asiatic peoples have taken the northern path; but, generally, westward moving migration and invasion have followed the southern road through Anatolia, and all westward movement of civilization which did not travel on shipboard took the same path.

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* The following paper was in its inception the preface to a Report on Exploration in Asia Minor, addressed to the Trustees of the Wilson Travelling Fellowship in Aberdeen University; it merely suggests questions and indicates promising lines of exploration. Much is necessarily omitted, and I hope not to be taken as disbelieving or ignoring the considerations which I have been unable to include in a brief paper.

[Map, p. 372. We are greatly indebted to Dr. Richard Kiepert for much fresh material which has been used in constructing the map that accompanies this paper.—Ed. *G. J.*]

Of the many invasions in which Europe has retaliated and sent her armies eastward over Asia, only one of any importance has passed north of the Caspian, and that is the great movement now going on, whereby Russia is throwing her armies, her railways, and her peoples over Asia to the shores of the Pacific. Otherwise, all movements eastward from Europe, in so far as they did not go by sea—the movements of armies, of pilgrims and Crusaders, of state messengers, of merchants and trade—have followed the lines that lead eastwards over Anatolia.

In the second place, Anatolia is a bridge with lofty parapets. The roads traverse the high, hollow, central plateau, closed in by loftier mountain ridges which separate that open plateau from the sea. The parapet on the south is the vast ridge of Taurus, stretching back from the western sea into the main central mass of the great Asiatic continent, only at a few points traversable by migrations or by armies, or by the rivers that drain the plateau and flow south in deep chasms cut through the heart of the mountains. It is not meant that Taurus was ever absolutely untraversable. Men can traverse any mountains, and there are ridges more difficult than Taurus. But it is practically impassable in unfavourable weather, and during the many months when it is covered with snow; and at all times elaborate preparation and provision must be made for the crossing of a body of men. Thus in practice the roadways were few, and migrations were confined to known lines.

The mountains which form the parapet on the north, though not so strikingly continuous, and at no period in history called by one single name, are really almost as serious a barrier to confine the tides of movement to the Anatolian east and west roadway. You enter the roadway at one or other of a few points, where alone entrance is easy, and you are driven on, eastwards or westwards, according to the temporary direction of the tide. If you come from the west, you enter with Godfrey and the Crusaders at Dorylaion, or with Alexander the Great at Celænæ. Until a few years ago you entered the bridge on horseback or on foot; now you enter in a railway-carriage. You move on eastwards, and pass off the bridge by one or other of a few well-marked exits. If you come from Asia, you follow the same inevitable paths; nothing differs except the direction of your motion and the tides or the motives that impel you.

Thus the history of Anatolia has been one of startling vicissitudes, of constant variety, of rapid changes in population, in government, in the trend of development; and yet the unity amid the variety is so easy to comprehend that it may fairly be called unmistakable. The development has always lain in the action and collision of forces moving eastwards or westwards; it has never been complicated by side influences coming in from the sea on the north or on the south; it has been simply the series of phases in the immemorial conflict between Europe and Asia. The central point of that never-ending battle varies from time to time. At one time the Greeks gather to a siege of Troy; at another the Arabs or the Egyptian Memluks storm the walls of Tarsus, defended by Greek fire or by Crusaders' axes and lances, or by that small fraction of the Armenian kingdom of Cilicia who could be induced to forget their mutual quarrels about points of ritual and to unite to save their own families against the slaughterers from the East; at another the Arabs are being beaten back repeatedly from the ramparts of Constantinople, or the Turks are pouring in through a breach. As you cast your eyes back over the past, you see Crœsus crossing the Halys to destroy a great kingdom, or the younger Cyrus the Persian leading 10,000 Greeks from Sardis to Mesopotamia, to show them how easily a vast Persian army might be scattered by a few trained and disciplined troops. You may see Louis VII. on New Year's Day in A.D. 1148, with his French Crusaders, fording hand-in-hand the unfordable Mæander, and scattering before their first charge the Turkish army drawn up on the further bank to prevent their crossing; * or Manuel with his splendid army of mail-clad warriors, European and Byzantine, jammed in that long narrow defile near Pisidian Antioch, and crushed with the stones and darts of the Turks on the hills above. If you want to see what happened when an army abandoned the few recognized paths, cast your eyes on the soldiers of the First Crusade, wandering and perishing amid the mountains of Anti-Taurus, or Frederick Barbarossa's German Crusaders struggling over the central Taurus, fed by an Armenian prince in his stronghold among the mountains, and Barbarossa himself disappearing under the waters of the Calycadnus so suddenly that his people could not believe he was dead, and long imagined that he was only waiting the proper moment to reappear in his German home. All are but small skirmishes in the great battle of East and West.

To illustrate this principle fully would be to write the history of the Anatolian peninsula. In every age, in every war, in every crisis, the opposing forces may be recognized as respectively Eastern and Western. Often, where two rivals contend for the succession to a throne or a tent, one may be recognized as champion of the East, and the other, as his opponent, attracts to his side the support of the West; and probably that would be found to rule in every such contest, though we are not always well enough informed of the facts. But the writer's 'Historical Geography of Asia Minor,' which has had the honour of being published by the Royal Geographical Society, illustrates on page after page the infinitely varied forms in which the principle has worked itself out in history (though, from its extreme brevity, it gives only the dry bones of history, into which the reader must breathe life for himself);

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* This brilliant feat of arms is wrongly attributed by Gibbon to Conrad, the German Emperor, who also took part in the second crusade. On the scene, see 'Cites and Bishoprics of Phrygia,' vol. i. p. 162.

and we pass from it. I may only be permitted to say, in passing, that the experience and study of twelve years since that book was written have amply confirmed the general scheme of topographical history contained in it, and also furnished both many corroborations of details in the application of the general rules and many improvements or corrections in other details. I do not know which have given me personally greater pleasure; it is pleasant to find that one's instinct or reasoning has been right, but it is almost more pleasant to find that a mistake has been put right and a stumbling-block cleared away. The corroboration gives one confidence to go on in the path of investigation; but the correction opens a door, and often reveals a new chapter in the political or historical geography of the country. Moreover, most of the corrections have come from investigators whom I might almost venture to call pupils of my own, because they made their first essays in my company or with my advice; and it is always a peculiar pleasure to learn from men whose early steps one has helped in some small degree to direct.

One of the omissions in that book was that the importance of the mountain barriers on the north and south was not sufficiently worked out, and thus several chapters of history passed unobserved. To this subject my studies have recently been directed, and they have been illuminated by explorations which, after a long interval of ten years, I was enabled to resume by a concurrence of favourable circumstances. One point in this wide subject may detain us for a few moments.

The great mountain wall of Taurus, on the southern side of the plateau, has always been the most effectual boundary-line in the Anatolian peninsula; and this in spite of the fact that the plateau has rarely been the seat of a capital, but has generally been subject to one of the great empires of the east or the west. Many causes of course contributed to give Taurus this importance as a dividing line; but we here simply assume the fact without analyzing the contributory causes.

The ancient historical records often express the bounds of nations or of spheres of influence by the phrases "within" or "beyond the Taurus." More than at any other line, one feels that at Taurus falls the dividing-line between east and west. Even at the present day, when the whole of Anatolia outside the walls of Smyrna and the railway-lines is in a sense distinctly Oriental, one feels that when one crosses Taurus by the great pass of the Cilician Gates and descends south and east into Cilicia, one has crossed a line of demarcation, and is surrounded by a more Oriental spirit. Cilicia, as the Romans long arranged it, is more a part of Syria than of Asia Minor. In it you detect at once the impression of the Arab and the Ansarieh; you hear yourself addressed no longer as Tchelebi, which was practically universal as a title of respect before you crossed Taurus: the people now style you Hawaja, as in Syria or Egypt. That single detail is significant of the changed atmosphere that rules beyond the Taurus.

In my 'Historical Geography' the contrast between the Ægean coastlands and the rest of the great peninsula is described, the former being, as it were, a part of Greece, full of the light and the variety and the joyous brightness of the Greek lands; the rest, including the whole plateau, being, alike in geographical character and in spirit, part of Asia, impressive in its immobility, monotony, and subdued tone. But one feels inclined to draw a further distinction, and to describe the west coast as Greek, the plateau within Taurus as the Debatable Land, and the country beyond Taurus as Eastern and Asiatic. Yet the moment that one has uttered the words one feels that they are inaccurate. More than any other city, Tarsus impresses one as the meeting-place of East and West. And in history what variety is there in the lot of Cilicia and in the kind of division which Taurus marks!

In the long wars between the Byzantine, or rather the Roman, Empire and the Saracens, Taurus with Anti-Taurus divided the Romans from the Arabs for centuries, Tarsus on the south-west and Melitene on the north-east being the frontier fortresses on the Arab side. The Arabs twice attempted to advance their frontier from Tarsus over Taurus and to hold Tyana; but both the Caliphs Harun-al-Rashid and Al-Mamun, who built a mosque and stationed a garrison in Tyana, found it necessary to draw back to Tarsus before two years had elapsed. For a longer period they held Cæsareia, in their advance from Melitene; but that also they failed to hold permanently. They could never establish themselves beyond Taurus. They crossed Taurus in their annual raids, often in two raids per annum; they captured almost every city in the whole land; they thrice besieged Constantinople; and yet through more than three centuries of such war they never held a foot of land beyond Taurus outside the range of their weapons at the moment. They conquered and they passed, and the people of the land recovered from every blow with marvellous rapidity. In all history there is probably no other proof so striking of the elasticity and recuperative power that belongs to the well-knit society of an organized people, welded together by a long-established system of reasoned law and by a common religion. Roman society was too compact for the Arabs to conquer—a hundred battles and a hundred defeats had no serious effect on it. The lower civilization of a loosely knit Oriental despotism could make no impression on the fabric that Roman organizing genius had created.

But, if the Roman social fabric survived the sufferings of those terrible centuries, when Arab raids were to be dreaded every year, the suffering was terrible. The Roman civilization had weakened the stamina of the nation, and a long continuance of peace had made the general population feeble, unwarlike, perfectly content to be defended by a professional army, which had become almost a caste.

When a civilized people has lost the strength, which must in the last resort be its defence against the attack of barbarism, it is always in danger. The professional army might have been able to defend the line of Mount Taurus and keep the Mohammedan wolves from the Roman sheepfold, if the great pass of the Cilician Gates had been the only way of crossing Taurus from Cilicia. That pass, an easy road for the most part to traverse, is also a very easy one to defend at many points by even a small force. In Byzantine time it was strongly garrisoned, and a line of beacons flashed the news to Constantinople as soon as the Arabs were moving against it.

But the long-continued peace and prosperity of the Roman Empire had opened other roads. Taurus had never been an absolutely impassable barrier, and under the Roman peace many cities had grown and prospered in its highest grounds, where now no dwelling is known except a few black tents of nomads in the summer. Those cities, rich and prosperous, had improved the roads, and made it easy for the light raiding armies of the Arabs to cross the mountains. A large population of traders and artisans, clergy and schoolmasters, and other peaceful persons, was powerless before a small force of hardy barbarians, accustomed to weapons from infancy, regarding war as the one business of life and the chief duty of religion. Hence the Arab raiders could go where they pleased, ravage almost any city they chose, and easily avoid the slower regular armies of Roman trained soldiers; but they could hold nothing permanently beyond the line of Taurus.

If, at a later time, the more barbarous Turk achieved what the more polished and more fiery Arabs had failed to do, the Turkish triumph exemplified the only way in which barbarism can conquer a civilized and organized society, apart from practical extermination, viz. by breaking up the fabric and constitution of society and reducing it once more to an aggregation of disconnected atoms. As the present writer has elsewhere shown, the Turkish conquest was not achieved by battles and victories; it was gained by the nomad tribes which spread over the land, destroyed the bonds of communication which held society together, and reduced the country from the settled to the nomadic stage. The Turkish conquest meant the nomadization of the country.

That word "nomadization" opens up a great subject, and I have been asked to give more space to it than it occupied at first in my manuscript. The subject is one which, so far as I know, is hardly alluded to by the professed historians. As you read the history of the two centuries following the appearance of the Turks on the eastern horizon of the Roman Empire about 1070 A.D., you often wonder how it was that the Seljuk Turks overcame the empire. After their first great victory at Manzikert, whose character can only be guessed, their armies were never able to meet in fair fight and on even terms a Byzantine army,[*] if the latter was led with any degree of prudence or skill. Yet the Roman civilization, which had resisted three centuries of continual Arab conquest, steadily grew weaker and died out before the loose, undisciplined, ill-organized Seljuk power. The story of the Seljuk conquest of Asia Minor has still to be written (for Gibbon's brief generalizations are hardly satisfactory, and Sir H. Howorth's admirable essay makes us desire a detailed study according to localities), and here it can only be alluded to in the briefest terms.

The Turkmen nomads are distinguished from the Turks proper as clearly by the Byzantine historians[†] as they are by the facts of the present day; and the incidental statements of those historians as to the insidious progress of the nomads over the country are very instructive. The picture that those Byzantine writers set before us has been summed up by the present writer in the following words: "The nomad Turkmens spread over the face of the land; the soil passed out of cultivation; the population decreased; the Christian cities were isolated from each other by a sea of nomad wandering tribes; intercourse, and consequently trades and manufactures, were to a great extent destroyed; and gradually the Christians in most places acquiesced, as we have seen, in the Oriental spirit and the Oriental religion of the dominant race. It is a remarkable instance of degeneration from civilized to barbarian society, and one which it would be instructive to study in detail; but the general fact is summed up in the phrase, the nomadization of Asia Minor."[‡]

The great numbers of the wandering Turkmen tribes explain one striking fact in the Seljuk Empire. The many magnificent khans built by the Seljuk sultans along the principal roads that radiated from their capital, Konia, form one of the most impressive features of modern Anatolia, and are worthy of mention along with the beautiful Seljuk mosques, medressés, and tombs, as evidence of the remarkable development of architectural art in that period.

Recent German travellers describe those khans as a proof of the high stage of civilization on which the Seljuk State stood; and the latest of those travellers thinks that the khans have taken the place of similar Roman and Byzantine buildings, and conserve in their uniform plan the accepted method of Byzantine khans.* But this view requires serious modification. As those same travellers remark, the great Seljuk khans are almost like fortresses, with their massive walls and their single well-protected entrance. Not a trace remains of any similar Roman or Byzantine building, and this furnishes a conclusive proof that the inns and *mansiones* of the civilized empire were buildings of a much humbler and more evanescent character; private initiative then furnished sufficient entertainment for travellers without the artistic and architectural magnificence of the Seljuk khans, and forts were not needed. The khans attest a high development of art, but not a sound condition of society and government.

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[*] I speak here only of the Seljuks, not of the Osmanli (Ottoman Turks), whose Janissaries were the best force in Europe; but the Janissaries were the tax levied in brain and muscle on the Christians.

[†] Some evidence as to the spread of the nomadic tribes in the twelfth and thirteenth centuries is quoted in my 'Historical Geography of Asia Minor,' p. 213. See also the following note.

[‡] 'Impressions of Turkey,' p. 103. The progress of the nomads in the western districts is described in my 'Cities and Bishoprics of Phrygia,' vol. i. pp. 16 f., 27 [illegible] 299 ff.; vol. ii. pp. 372 f., 447, 598, 695.

The truth is that such buildings as the Seljuk khans were not built or wanted in the Roman and the Byzantine period. But in the Seljuk time the caravans, which maintained trade and communication between the surviving cities of the land, required the shelter and protection of those vast fortress-like constructions,† for the roads connecting the greatest cities of the Seljuk state were unsafe. The cities were like islands in the ocean of nomadism; and the khans furnished harbours of refuge at short intervals in the dangerous voyage from city to city. If the country is safer in more recent times, the reason is that caravans and commerce were gradually destroyed on almost all roads, trade dwindled and died out, every town became perforce self-sufficient, and the empire ceased to be an articulated organism. On the few roads along which the markets of Europe still attracted a certain amount of caravan-traffic the danger continued, but where there were no travellers to rob and no trade to plunder, the nomads were either at peace or employed in mutual warfare, especially where the nomad Turkmens met the nomad Kurds. Hence the older travellers describe them all, Kurds and Turkmens alike, as unruly and dangerous, while the traveller at the present day finds them generally quite peaceful and quiet. I have spent many nights in encampments of Turkmens or Kurds in the great central plains,‡ or in Kurdish villages of the eastern parts of Asia Minor, often arriving with two or three native attendants towards sunset; yet the nomad Kurds of Galatia have the most evil reputation, and were still during the last two decades a terror to all government officials. They never showed any disposition to molest myself or my friend, though they believed us to be owners of fabulous wealth. But I confess that I sometimes felt profoundly thankful when I was safely departing from the tents of those wandering Kurds, the rudest of all Anatolian tribes.

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* Sarre, 'Reise in Kleinasien,' p. 77 f.

† "Ein äusserlich festungsartiges Gebäude" (Sarre, p. 78).

‡ The Kurds of the central plains, especially of ancient Galatia, are more thoroughly nomadic than those of the more eastern districts, so far as I have seen the latter. The nomad Kurds are the most unattractive race in Asia Minor ('Impressions of Turkey,' p. 114 ff.).

But the number of questions which open on every side when one begins to discuss that great subject of the degeneration from Roman organization to the nomadic stage in Asiatic Turkey is endless; and we must return to our proper subject for the moment, viz. the effect of the Taurus range as a division between races, as a defence of a settled people against invasion, and as a limiting wall to determine the lines of migration.

If Taurus divided Arab and Roman, Mohammedan and Christian, in the time of the Saracen wars (641–975), it was again the boundary between Christian and Mohammedan in the early Turkish period for about four centuries beginning from 1071 A.D. The Turks came in from Central Asia over Armenia, and held the central Anatolian plateau for centuries before they gained possession of Cilicia; they captured Constantinople and advanced to Belgrad before they captured Tarsus. Christian powers, Byzantines, Latin Crusaders, and Armenian princes, quarrelled with one another for possession of Cilicia. Taurus saved them from Turkish armies, but there was no such barrier on the Syrian side, and the Memluk sultans of Egypt destroyed the Christian kingdom of Cilicia. Here again the nomad Turkmen tribes, gradually spreading across Taurus and over the plains, were the true conquerors, sapping and destroying the links that held together society in the country.

Thus the effect of the Taurus as a division between nations, as well as in directing and limiting the march of armies, might in itself furnish a great subject.

Only in one case is there a district of any importance in the Anatolian peninsula which lies outside of this classification, which we have described, into central plateau, mountain-rim, and coast valleys. There is one secondary valley on the north, where there intervenes between the plateau-rim and the sea a mountain-ridge parallel to the main ridge which forms the northern boundary of the plateau. Between these two parallel ridges there stretches east and west a valley of considerable importance, forming the most fertile part of the ancient country of Paphlagonia. That valley has a history which stands entirely apart from the history of either the plateau on the one hand or of the sea-coast cities on the other. Just as you might sail and explore along the coast, and travel extensively in the northern parts of the plateau, yet never enter the great Paphlagonian valley, and remain almost unaware of its existence, so you might write a minute study of the history of the coast and of the plateau, and hardly ever have occasion to mention the intermediate valley. And yet the valley had a great history; it contained some powerful cities. The wars of the Mithridatic dynasty of kings against the Romans and the states of the West, for the most part, were fought or manoeuvred along that valley. Some of the most obscure campaigns in the long wars between the kings of the Romans and the Saracen invaders seem to have taken place in the valley, and those campaigns are so obscure because the ordinary data for interpreting the evidence by the conditions of the plateau or the coast fail us for the intermediate Paphlagonian valley. Its cities became even more important, in comparison to the rest of the country, during the earlier stages of the Turkish period, and are often mentioned.

But that long history of the Paphlagonian valley has never been written. Its many ancient towns are for the most part unknown even by name. Perhaps the task cannot be achieved, because recorded history has kept to the leading paths, and neglected the byroads; but if the task is attempted it demands a special historian, who is prepared to explore and study it by itself and for itself.

Once you have reached the plateau it is, as a rule, possible to make a road almost anywhere. Yet even there there are certain gates towards which many roads must converge, and through which they must pass. A double zone of mountains, whose old names are unknown, and which are almost nameless in modern times, runs north and south across central Phrygia, and roads must keep either to the north or the south of them. All travellers from Ephesus to the east passed by the southern end of those mountains; but travellers from Smyrna and northern Lydia generally went by the northern end. The two modern railway-lines mark the two routes.

The lofty ridge which comes up from the west, from Trojan Ida, called Temnos and Dindymos in parts of its course, approaches very close to those central Phrygian mountains, and a narrow glen, down which flows a tributary of the Mæander, divides them. That glen forms a funnel, up or down which roads and travellers going in very diverse directions must necessarily pass. For about 10 or 12 miles persons going from south to north travel side by side with others who are going from east to west. Their roads all converge to one end of the glen, and diverge again at the other.

Until that glen was noted on the map, and its importance observed, the march of the Ten Thousand, which Xenophon has described, was an insoluble riddle. In my earlier years of exploration, having only the vague, featureless, and inaccurate old maps, I found that glen a sore trial and puzzle. Filled with the desire to be constantly traversing new routes, and to avoid repetition, I found myself in the most annoying way doing the treadmill up and down the glen. In one year, when thoroughly on my guard against it and resolved to avoid it, I traversed it three times.

But this repetition only gave proper emphasis to its importance. Then it became obvious that the Ten Thousand, who had marched from Sardis towards the southern end of the central Phrygian mountains, as if to follow the southern route, and had turned backwards towards the north-west, must have traversed the glen and gone round the northern end of the mountains. No other way was possible, and when this observation was applied, it was easy to follow the march of the Ten Thousand all over Phrygia, and to say at any point that Xenophon's foot must have trod within a few hundred yards of where we stood. At the south-western entrance to the glen stands Keramon Agora, the Market of Tiles, that peopled city; and after leaving its north-eastern exit, the eastward bound army soon found itself in the broad plain of Kaystros.

The exploration and communication along the coasts took place almost entirely, of course, by ship, and lie outside our present subject, except in so far as it affected or was affected by land conditions. The fact that at various points the mountains touched the sea, and made the coast road tedious and difficult, threw the communication more and more completely on to shipboard, and this meant that communication along the north and south coasts was for centuries entirely in the hands of the Greeks, and that the coast towns, even so far east as Tarsus and Trapezus, were strongly affected by Greek influence, and often even transformed into cities of the Greek type, with free institutions and constitutional government by elected magistrates according to published law.

Moreover, the sea was dangerous and difficult. On the north coast, the Black Sea was the most uncertain and treacherous known to the Greeks: at no period of the year could the weather be counted on; in the most settled summer weather a tempest might occur. Far back, in the beginning of Greek history, we can dimly trace the immense influence exerted on the Greek mind by the first experience of that sea with its dangers and its wonders. It is not too much to say, though here we can only make the strong statement and pass on, that the discovery of the Black Sea played as important a part in forming and training the Greek mind, in determining its bent, in moulding its literary expression, as the discovery of America has played in the modern world. But to illustrate that assertion would need a whole evening.

But the life of a country is always mirrored and idealized in its religion; and the religion of the coast cities must necessarily have been moulded a great deal by their dependence on the sea. This we can observe well on the north coast. The Ruler of the Sea, Achilles Pontarches, was the great deity of the north coast cities; an association of cities was allied in his worship, and the high priest was called by the same name as the god, the Pontarch. The god had his chosen home in that island, far out in the sea opposite the mouths of the Danube, where he dwelt with Helena, the island which occasionally appeared before the storm-tossed sailor as a haven of quiet. But he was worshipped also in all the cities, whose prosperity depended on his favour, and the sailors made their vows to him before they sailed, and paid them after their safe return. He was worshipped in all the cities in South Russia, in the Crimea, as well as on the Asia Minor coasts; but probably his chief seat was in Sinope, that great harbour of the early time, on the promontory that juts out far into the sea. And when a new form of religion required a new expression of the old religious fact, a Christian saint was substituted for the pagan Pontarch Achilles; and St. Phocas of Sinope became the sailor's god, or at least their patron and protector.

The severance of the north coast from the plateau is thus as strongly marked in religion as in history. It would not, however, be true to say that the severance in religion was absolute. The mountain-ridges which barred and hemmed in ordinary communication offered no insuperable barrier to the spread of religion. The strange fervid cults of the plateau proved as impressive to the coastlands as they did in the European lands to which they spread in wave after wave. The divergence in the religion of the coast took the form of additions to a common religious stock—such as the cult of Achilles Pontarches.

On the south coast less is known of maritime religious foundations. The existing records show little except gods of the common Anatolian type. Yet there must have been more. Especially at Myra, in Lycia, we may look for some special sailors' cult. Myra was the harbour for the direct over-sea communication with Syria and with Egypt. This communication was not old—the early ships never ventured to desert the coast and strike boldly out to sea. But at least as early as the first century of our era, the large ships which carried the Egyptian corn to the Roman granaries habitually tried to run straight across from Alexandria to Myra. A west wind blows with wonderful uniformity in the Levant, and those ships could commonly trust to a good run due north to the Lycian coast. But if the west wind blew too strong, the ship would make too much leeway, and find itself unable to clear the western end of Cyprus; and then it was obliged, in the peculiar conditions of navigation there, to run to the Syrian coast and keep round the east and the north of Cyprus. In such circumstances the blessing of the god of Myra would be sought with special devotion; and, though this cult is not proven in its pagan form, which as we have seen was only of quite late origin, the Christian cult which took its place is well known. St. Nicholas of Myra played the same part among the sailors of the Levant as St. Phocas of Sinope did among those of the Black sea.

Phocas was a martyr of the reign of Trajan. Nicholas was Bishop of Myra more than three centuries later. The Christian form evidently established itself earlier on the north coast than on the south, and this is in strict accord with other evidence, which shows that the new religion had taken deep root in the northern coastlands by the time of Trajan, whereas on the south it was very much later in attaining such strength.

But it was not merely armies, or migrations of peoples, which have swept eastwards or westwards across Anatolia. Art, knowledge, new thoughts and new religions have trod the same path in either direction; they, too, move only westwards or eastwards across the bridge, rarely if ever northwards or southwards. Such movements, though less imposing and romantic than the march of armies and the combat of heroes, may justifiably detain our attention longer, precisely because they are less striking and more easily escape notice.

There are some apparent exceptions, which, however, vanish under more careful scrutiny, and therefore only help to emphasize the general principle. One example may here be given. The present writer is responsible for the theory (published in 1882) that the Greek alphabet, after travelling by ship with the Ionic Grecian merchants to Sinope, penetrated thence southwards across the mountains into the central plateau, where we find it in use east of the Halys about the seventh century B.C. But after further study he retracted this theory, and argued that the Greek alphabet went up eastwards from the west coast, in the ordinary course of trade and political relations; and dated that communication by the recorded fact that a king of Phrygia was married to a daughter of Agamemnon, King of Æolic Cyme, about 700 B.C. Historic tradition remembered that dynastic fact—a striking example of the way in which a royal family embodies and represents the history of its nation—and the union of the two royal families stands to us for the intercommunication between the active Greek cities of the west coast and the peoples of the plateau, in the course of which the alphabet and many other ideas passed eastwards or westwards. That second theory may now be regarded as the accepted view. Even those English scholars who accept nothing in history but what is printed in German may accept this view with easy minds, because it has been rediscovered independently by a learned and able young German professor, who began to travel in Anatolia about eight years after the second view had been published and republished in the *Journal of Hellenic Studies*, and soon found out and made known the truth, gently rebuking the error of the English scholar who had advanced the first theory.

Such movements of thought and religion are complicated by a new factor, the influence of the land: those movements did not merely sweep across the country like armies from one side or the other; sometimes they originated in the country; sometimes they were modified, profoundly or slightly, as the case might be, in their passage. An army may march across the country, gaining no material strength, but merely losing part of its force; but even an army may learn something in its long travels, and those who return to their own land may, like the remnant of the Crusaders, come back wiser and better able to understand the world than when they started.

This influence, this new factor, may take one of two forms. In the first place, it may arise out of the situation of Anatolia as a bridge and meeting-place between Eastern and Western ideas. When the thoughts and knowledge of two diverse peoples meet, either in alliance or in hostility, the result is not to be represented as a simple addition. Ideas are not like dead matter to be placed side by side: they unite and are productive, or they die; but they cannot remain inert and unvarying. The result of their meeting may be, and commonly is, more like a process of multiplication; occasionally, it is a process of division or destruction. For example, the invention of the art of coinage is attributed to Asia Minor by Herodotus; and modern opinion agrees unanimously with him. In the great highway of commerce and intercourse it was natural that this idea of a common measure of value, guaranteed by a trustworthy authority, should be struck out. Along with this invention we may refer to the speculation of M. Radet *—one of the most brilliant pages of his striking work on Lydia—that the organization of trade and caravans and bazaars, the typical Oriental method of commerce, belongs to the same country.

Similarly, the development and improvement in practical working of many ideas springs from the intercourse and jostling of many men and many minds along the great bridge. The simplification of chronological reckoning by the use of a definite era, so that a date can be expressed by a single number, may belong to Asia Minor; it became common, and probably it originated, in the adapting of Greek ideas to a wider sphere of practical life, which occurred after Greece went forth under Alexander the Great to conquer the East, when it settled down under his successors to the great practical problem of how to rule the conquered world. The cumbrous method of dating by the annual magistrates of the city, which commended itself to the patriotism and pride of the Greek citizen in Greece, became too obviously unworkable in the wider sphere of the Hellenized East. In no part of the ancient world is the custom of expressing dates by counting from a fixed era more firmly established in common everyday use than in one district of Asia Minor, embracing the eastern part of Lydia and western parts of Phrygia.

But, in the second place, there is a growing opinion among the most recent investigators—an opinion strongly held by the present writer—that Anatolia was not merely an intermediary, developing foreign ideas in a practical way, but also played a not unimportant part as an originator. We are inevitably forced back to a time when Anatolia was not merely a bridge between opposite lands and great peoples, but was itself the centre of a great empire exerting an influence on the outer world. The empire is closely connected with the most fascinating and

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* Criticized and accepted with some modification in the writer's 'Cities and Bishoprics of Phrygia,' vol. ii. p. 416.

the most obscure historical problems which are at the present time under discussion. Every step that is being made in the rediscovery of the early Greek world, and the history of early intercourse in the Eastern Mediterranean lands, constitutes at the same time indirectly an advance in the history of the ancient Anatolian world, even though the discoverer is not conscious of the side light which he is throwing on that subject. Twenty years ago that empire was not even dreamed about by any one; even yet it is almost an unknown quantity, which is to be estimated from its effects more than from direct evidence about its actual nature. But the direct evidence is slowly being discovered—very slowly, because there is no organized effort being made to discover it, but mere sporadic experiments by occasional travellers, generally inexperienced, who, as soon as they acquire experience and grow enthusiastic in the investigation, are drafted off to other spheres of life. But still discovery, though slowly, does progress; and what was reckoned only a dream ten years ago by many, is now an admittedly real factor in history, which has an acknowledged place in every modern discussion of the early Mediterranean world, and which, after ten or twenty years, will occupy far greater space than it does now. An ancient system of writing in hieroglyphics, different from any other known system of expressing thought by visible and permanent symbols, is known in Asia Minor through a long process of development, and is dimly traceable as an influence on other countries. Characteristic Anatolian artistic forms have been studied and specified by several investigators, though still they are chiefly evident as the unknown factor needed to explain the development of the East Mediterranean world. Most certain and most typical of Anatolia is its religion, the influence of which on the Greek and Roman world is the one form in which Anatolian influence has been long recognized by modern scholars. This they could hardly fail to do, seeing that the ancients themselves acknowledge it, describe it, and inveigh against it; but still it was left to comparatively recent scholars to show how far-reaching and long-continued that influence was; and among those scholars the most acute and able has probably been Mr. P. Foucart, formerly Director of the French School of Athens,* who writes of Anatolian religion entirely from the Greek point of view as being an outrage on the Greek spirit, relieved from being abominable only by becoming sometimes ridiculous in its fervour. But at least the fact is established that this influence spread in wave after wave of a sort of religious revivalism over the classical world, mostly among the uneducated classes, but still often affecting the population so profoundly as to receive State recognition or require State regulation and even coercion. For good or for evil, it was at least enormously powerful.

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* 'Les Associations Religieuses chez les Grecs,' 1873.

In all these departments, writing, art, religion (and doubtless others might be added), there is perceptible a connection with the geographical character of the country. Elsewhere the present writer has argued* that the hieroglyphics must have been originated on the great central plains; and he believes that an important part in the domestication of certain animals must be assigned to the same localities. The soil of those now desert plains is generally highly fertile. Only the application of water and skill is needed to make them very fruitful; and the ruins of large and rich cities are found where now the country is absolutely barren. The arts that were needed to utilize those wide plains were all embodied and taught in the religion of the country. The domesticated animals were all sacred, and the treatment of them was prescribed as part of religious ritual.

As might be expected, therefore, it is in religion that the direct influence of geographical features is most obvious. Ancient religion was far more intimately and universally associated with social and family life than is the case with modern European nations. Religion had made and ordered all social relationships. The individual was bound in the ties of religion from his cradle to his grave. Every act of his life, good or bad, joyous or mournful, moral (to our conceptions) or immoral, was equally presided over by a divinity, and, as it were, done under the divine sanction. The early religion of Anatolia was therefore the outcome of the whole circumstances and environment that acted on the people.

One feature in the Anatolian religion rises before us prominent and impressive at the first glance. The ordinary and familiar idea is that God is the Father of all mankind and all life. Such is the almost universal European and Semitic conception. But it was the motherhood of the divine nature that was the great feature in the Anatolian worship. The male element in the divine nature was recognized only as an occasional and subsidiary actor in the drama of nature and of life. The life of man came from the Great Mother; the heroes of the land were the sons of the goddess, and at death they returned to the mother who bore them.

In the social customs of Anatolia, even after it was overspread by Greek manners and Greek ideas, many traces remain of that primitive idea. Descent was sometimes reckoned through the mother; women magistrates are frequently found even in the Hellenized cities of the land. And in its history the same impression remains: it is everywhere the most pathetic of histories. Not vigour and initiative, but receptivity and impressibility, swayed the spirit of the people, marked their fate, and breathed through the atmosphere that surrounded them—a continuous, barely perceptible force acting on every new people, and subtly influencing every new religion, that came into the land. For example, the earliest known trace of the veneration of the Virgin Mary in the Christian religion is in a Phrygian inscription of the second century; and the earliest example of a holy place consecrated to the Mother of God as already an almost divine personality is at Ephesus early in the fifth century.

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* 'Cities and Bishoprics of Phrygia,' vol. i. p xv.

On the great level plains of the central plateau the spirit of man seems separated from the world by the mountains, and thrown back on its own nature; but it is not confined, for the idea of confinement is absolutely alien to that vast expanse, where the sole limit to the range of the human eye seems to be its own weakness of vision, where a distant mountain-peak only emphasizes the sense of vastness because it furnishes a standard by which to estimate distance. The great eye of heaven, unwearying, unpitying, inexorable, watches you from its rising over the level horizon till it sinks below the same level again. There is a sense of rest, of inevitable acquiescence in the Infinite Power which is around you, all-pervasive and compelling. The sense of individuality and personal power grows weak and shrinks away, not daring to show itself in the human consciousness. The phases of the year co-operate in this effect, with a long severe winter and a shorter but hot summer. Where water pours forth in one of the many great springs which give birth to strong flowing rivers, the country is a garden; but otherwise the fertile soil is dependent entirely on the chances of an uncertain rainfall. The north wind tempers the heat, and the harvester trusts to it entirely to winnow his grain on the threshing-floor. Everything impresses on the mind the utter insignificance of man and his absolute dependence on the Divine power. The peasant of the present day still calls every great life-giving spring "God hath given."

But the Divine power that was so evident was not the stern, inexorable power of the hard desert. The people saw the nature of the land, rich and full of good things to those who accepted the divinely revealed method, and cared for the holy soil and the sacred animals, as the goddess, their mother and patron, required. St. Paul, with his usual unerring insight into the character of his audience, spoke to the rude Lycaonian peasants about the God "who did good, and gave rain from heaven, and fruitful seasons, filling the heart with food and gladness."

For the student of that country and history, it is always and everywhere necessary to go back to that religion, to recognize it as the originator of all national life and of all social forms, and as a continuous force acting throughout the later development of the country.

In the exploration of the city of Ephesus an example may be found of the use that might be made of this principle. Mr. Wood spent six years searching for the site of the Temple of Artemis, and at last he found it exactly where it ought to be, beside the little hill on the top of which was built the great church of St. John, and on the lowest slope of which is the splendid mosque of Isa Bey. The church was the largest built by the Emperor Justinian, that greatest of builders with the single exception of the Emperor Hadrian.

The historical process is obvious, since Mr. Wood's discovery disclosed it. The dominant Christian religion had to claim for itself the sanctity attaching to the ancient site. It did so by building that great church overlooking the temple. But Christianity gave place to Mohammedanism, and again this new religion made itself heir to the religious associations and holiness of the locality by constructing between the two older religious sites one of the largest and most splendid mosques in the whole country.

The history of Ephesus is an extraordinary series of vicissitudes, but the religious centre is always the same. The Greek city was at a distance from the religious centre; it aimed at commercial or military advantages, and its site was changed more than once as the sea-coast receded. The holy place was the governing centre of the plain before the Greeks came; its priests watched the Greek cities grow and change and decay. The outward form of the religion was altered, but the old belief was not extirpated, and it took new root in the heart of the conquering religion, so that in the fifth century we find the legend of the Virgin Mother of God firmly established among the Christians of Ephesus, though it was not strong enough to obliterate the historical fact that the Holy Theologian had lived many years and died in the city. But the belief in the old holy place was a force always attracting the population thither, and growing stronger as the standard of education in the Eastern Church degenerated, and at last proving irresistible. Thus the centre of population was moved back to the old centre of religion. The old Asiatic paganism had proved too strong alike for the Greek trade and education and for the Christian teaching. The Greek spirit had come, and lived for twelve hundred years, and died of weakness, but the old beliefs continued as strong as ever. The old goddess had not merely her home in the open plain among the haunts of men; she was the goddess of wild nature and nursing mother of all wild animals, and she had her other home among the mountains on the south of the plain. And so among the Christians the home of the Virgin Mother of God was discovered and made a centre of worship and pilgrimage near the old mountain house of the Goddess-Mother.

An apparent exception to the principle that the great movements of history and thought must either keep to the coast-lines or to the central bridge, and that no great movement on the central plateau ever springs from the northern or the southern coast, is presented by the enterprise which carried the first Christian mission from Perga on the Pamphylian coast to Pisidian Antioch and the neighbouring towns on the central bridge. The theologians have disputed, and will doubtless dispute to the end of time, about that sudden transition; but the geographer and the historian who study facts instead of starting from theories can never hesitate as to this great fact. The first mission movement began to work its way westward along the sea-route by Cyprus and the Pamphylian coast; and at this point it deserted the coast-route and transferred itself to the far more fruitful and important land-route over the central bridge. The important movements of thought had almost always taken the land-route, for the coast-route affords only narrow and limited opportunities along its course. It was easy for the pioneers of new ideas to carry them by sea from the Syrian shore to Athens or to Rome; but by the way they made no impression and left no seed. On the other hand, along the land-route new religious movements worked their way by conquering the cities and the peoples through which they passed: they planted themselves firmly at each stage, and each step was the preparation and the basis for a further step.

Of the many movements of thought that have occurred along the great bridge, the only one which can be traced in any detail is that by which Christianity was diffused over the country and into Europe; and it would be an instructive example of the principles which have just been laid down to study that important movement. But it would need a separate article to do so even in the briefest outline. One may only say here that the current conception, which indicates the spread of that movement by a series of lines radiating from Syria across Asia Minor to the north, north-west, and west, is entirely incorrect. The movement of thought was along the great bridge, by the road on the southern side of the plateau, direct west from Syria to Ephesus, and then back again in return waves along the north coast by sea, and along the northern roads over the plateau by land. And probably the older movements, about whose diffusion we have no information, exemplified equally the same geographical laws.

Before the reading of the paper, the PRESIDENT said: This is not the first time that we have had the pleasure of welcoming Prof. Ramsay in this room. I am proud to say that our Society has had a great deal to do with the extremely valuable work of the Exploration Fund in Asia Minor. I now call upon Prof. Ramsay to read his paper.

After the reading of the paper, the following discussion took place:—

The Rt. Hon. JAMES BRYCE: I feel great diffidence in saying anything upon the most interesting and instructive paper which we have heard from my friend Prof. Ramsay, because I see present several accomplished travellers whose knowledge of Asia Minor is far more extensive and profound than any I could claim. Among others I see Sir Charles Wilson and Mr. Hogarth, who both know Asia Minor thoroughly, and are undoubtedly more competent to speak of it. My knowledge is slight, and is practically confined to the north and west coasts. I have never had a chance of travelling over the central plateau which gives its distinguishing character to Asia Minor as a whole. The paper seems to me an admirable illustration of the way in which history should be studied in connection with geography.

It lays down the bold lines which determine the character of the country, and it brings these into association with the successive movements of religion, of politics, and of commerce by which the whole history of the country has been determined. If we could make historical study start from a thorough knowledge of the geographical conditions and physical structure of a country, we should make it incomparably more valuable as a means of general mental training and as a basis for all kinds of human knowledge than it has yet been in most places made. One could wish nothing better for those who are endeavouring to secure for geography its proper place in education than that they should read and meditate on such a paper as Prof. Ramsay has given us. One felt, in listening to his paper, how much freshness might be given to historical teaching were it made to begin from a study of mountains and valleys, and to show how these determined the succession of events. I was reminded by some passages in his address of another remarkable plateau, also the home of an early civilization, also the scene of great events—I mean the great plateau of Mexico, which in some respects bears a similarity to Asia Minor in the character of its elevation, in the abruptness of its declivities, especially towards the east, and in the contrast between the early populations which inhabited the upper levels of the plateau and the populations which dwelt below. But, unfortunately, our historical knowledge of what passed before the Spanish conquest is so slender, and the natural course which American history would probably have taken was so completely interrupted by that conquest, that one can simply suggest the analogy. As respects the destruction of the prosperity of Central Asia Minor by the incoming of the nomads, while expressing no disagreement with Mr. Ramsay's view, I should be disposed to add that the decline in the machinery and administrative organization of the East Roman monarchy was a concurrent cause, accelerating the process which the paper describes. I was much struck by another remark which Prof. Ramsay made in the latter part of the paper, where he referred to religion in Asia Minor. He pointed out that one of the ancient civilizations which must have had most influence, but about which we know least, had its original source in the plateau of Asia Minor at a time practically anterior to any recorded history, at a time before the growth of the Lydian Empire, and contemporaneous with the earlier Babylonian Empire. And he passed on to speak of the religious influences which had their origin on this great plateau. It struck me, in listening to his observations, that it is a noteworthy fact that all the great religions of the world have originated among peoples not connected with the sea. If we take the great historical religions, such as Buddhism, the religion of ancient Egypt which had an enormous importance for the ancient world, the religion of the Hebrews, the religion of Persia from the time of the Zend Avesta to modern Parsiism, Christianity and Islam, you will see they all originate with peoples who have little or nothing to do with a seafaring life. There seems to be truth in Prof. Ramsay's suggestion that it is intensity which makes the power and strength and permanency of a religion. It is not susceptibility to new ideas which makes a religion powerful, enabling it to lay a strong grasp upon the mind of the nation in whose midst it grows up, and rendering that nation able to communicate to others the faith which has had power over itself. The religions which sprung up in races connected with the sea, of whom we may put the Greeks and Phœnicians as examples, although they obtained local influence, never exercised the same wide sway over the hearts and minds of men, never had the same permanency and strength. And among these intenser forms of faith, although we know least about it, we may perhaps reckon the religion whose primal seat is usually attributed to Phrygia. There can be little doubt that the religion of Phrygia embodied in the worship of the Great Mother must have had a very powerful influence not only upon the familiar worship of Greece, but upon that curious under-current of Greek religion which concerned itself comparatively little with the Olympian deities, but showed its power in the so-called mysteries and various other recondite ways. There are, indeed, traces of its influence upon early Christianity also. I cannot help hoping that the ideas he has given us on this topic will hereafter be worked out more fully than in the extremely interesting but necessarily concise paper with which he has favoured us to-night.

Sir **Charles Wilson**: I can only echo what Mr. Bryce has said with regard to the importance of Prof. Ramsay's paper. You may have noticed that it is very different in character to many of the papers which are read in this theatre. Prof. Ramsay has never once mentioned himself or any of the dangers and difficulties of travelling in Asia Minor, but his paper is a very important contribution to the history and geography of that country. It is impossible, or very difficult, to criticize the generalizations which he has made; but you have the result of over twenty years' study of the country, instead of, as we often have had in this theatre, a record of personal adventure, or diary of exploration. There are few points upon which I wish to say anything. One is with regard to the nomadization of Asia Minor. We have contemporary records of the way in which the nomads devastated the country. They cared nothing for town life; all that they thought about was food for their flocks and herds. For three centuries a succession of nomad tribes passed through the country; they ate up everything as they went; they cared nothing for agriculture, or whether the people in the towns starved or lived; and they entirely ruined perhaps one of the richest countries in the world. I think that Prof. Ramsay has placed the ruin of the country by the nomads a little too early. I should be inclined to attribute it to the passage of the Mongols through Asia Minor, and all that the Mongols left behind them was swept away by the advance of Timur and his Tartars. But I entirely agree with him as to the way in which the towns were isolated by the advance of the nomads, and the difficulty of keeping up communication between town and town. I may perhaps mention that the Seljuk Turks, who must be distinguished from the Osmanli Turks who followed them, were not only great builders of khans, but of other public buildings. I do not think anything impressed me more, as a mark of the great power and architectural skill of the Seljuks, or rather of the foreign architects employed by them, than the great works at Alaya, on the south coast of Asia Minor, which I might almost call the Portsmouth of the Seljuk Empire. The slips and other buildings connected with the navy of the Seljuks were built in the same solid manner as the beautiful khans which are scattered over the country. So also with regard to the mosque architecture. I think the style of architecture in the Seljuk mosques and in the Medressehs, which they built throughout Asia Minor, is one of the most beautiful that I have seen. I remember bringing it to the notice of the late Mr. Fergusson, the well-known architect, to whom it was unknown; and even now we have little information respecting the details of these beautiful buildings. With regard to the importance of the Taurus as a dividing range, I may perhaps notice a fact which Prof. Ramsay did not mention. In the last century the range was the boundary between the territories of Egypt and those of the Turk for about nine or ten years. The Egyptians, who had advanced as far as Kutaya in Asia Minor, whence they were obliged to retreat by the European Powers, had their boundary at Mount Taurus, and there are still in existence, in the great pass of the Cilician gates, the forts which were thrown up by Ibrahim Pasha as a defence against the advance of the Turks into Cilicia. I may perhaps mention that Prof. Ramsay intends to visit Asia Minor again this year. There is one particular investigation which Prof. Ramsay has been very anxious for many years to carry out, and in which he is extremely interested—the excavation of the site of Lystra, which is well known. Very important results may be expected from such exploration, and I hope that in a not far distant future, funds may be subscribed to excavate that very ancient and interesting biblical site. I think that Prof. Ramsay's paper is one of the most important which has been read for some time in this theatre.

Mr. D. G. Hogarth: Certainly Prof. Ramsay's ideas do not belong to that dead matter of which he has spoken. The points which struck me most are those which concerned the question of the nomadization of Asia Minor; many of them were so obvious, when they had been said, that one wonders they had never been said before; but so far as I know they have not, but they now seem to me to be final. I was specially interested in that suggestion of how a barbaric society can split up a society very much stronger, more organized, and more ancient than itself. Of course, in a paper so full of ideas, there are some which are sure to provoke a certain amount of criticism. There are two particularly which I should like Prof. Ramsay, if there is time, to say a word more about: one is the main idea of the paper—the significance of the Taurus. I do not really mean to criticize the main contention that the Taurus is an extremely important mountain range, but I am not quite certain whether it has accounted for quite as much as Prof. Ramsay seemed to indicate. I have various reasons. He spoke of Cilicia being an Oriental country in strong distinction to anything on the other side of the Taurus; but I would venture to remind him that Cappadocia and Pontus had a very strong Oriental colouring from an early time. Furthermore, as he knows, and as I have had reason to know, and still more Sir Charles Wilson has had reason to know, the Taurus is far from an impassable range. It is, on the whole, an easily passed range; it contains almost the easiest pass in the world—that is to say, the easiest if not defended by a hostile army—and it has often been, as a matter of fact, passed by empires, by armies, and by nations in the past. I would only call attention to one fact, and that is that Asia Minor was for a long time part of an empire which had its centre in Syria. There was at that time no very impassable barrier in the Taurus range, and although it is quite true that the Arabs never succeeded, although they often passed the Taurus, in holding land on the other side, I would ask whether that is necessarily due to the impassable nature of the wall-like Taurus, or whether it may not be partly due to considerations of latitude and of sea-level? The nomads who came into Asia Minor came for two main reasons. Their perennial unrest is due to the fact that there are very large tracts of country in Asia which are of a lean character. These nurture and raise a hardy population which rapidly increases, but for whose increase the land does not provide sufficient subsistence. They are, therefore, always moving. They move like air—where there is a vacuum. Asia Minor has provided that vacuum, and they have moved towards it from the two main areas, the one being the Central Asia area, the other being the Arabian area. Though it is true that the nomads who came into Asia Minor did come from the northern area, I would ask whether that is really due to the greater ease of communication, or rather to the fact that those who came from the Arabian area were unfitted by the latitude in which they had been born to effect any permanent lodgment on so cold an area as the Asia Minor plateau. The other point—and here we are very much in the region of conjecture—was connected with that interesting section towards the close of his paper, when he spoke of the possibility that Asia Minor had not always been a bridge, but had been itself the source of certain strong influences, and, as he indicated, perhaps of a very considerable independent empire in very early times—that is, the empire which has been dimly indicated for some time past by what are called the Hittite monuments. Though I do not deny the fact that Hittite monuments are spread over Asia Minor and are monuments of very great importance, I am not sure whether we have reason to say the centre of that empire was in Asia Minor. It would be very difficult to accept that without strong proof in face of the fact that in historic times no empire had its seat in that country. It is a very significant fact that the main successor of Alexander, as soon as he aimed at anything more than a small government, passed out of Asia Minor, and established the centre of his empire, not in Asia Minor, but in the north of Syria, and there his successor built the most famous city of Hellenistic times. Therefore, what we find is, that while armies and kings were continually passing through Asia Minor, while great battles were fought in Asia Minor, at every one of which an empire was lost and an empire was born, at the same time, after those battles the victor did not establish himself in Asia Minor, but passed to one side or the other. That being the case, it raises a strong presumption, there being no authority where we can get any information—it raises the presumption that the centre of "Hittite" empire was not in Asia Minor, but was in one of the more fertile regions to the north-west or the south-east. Asia Minor is, of course, a rich country up to a certain standard, but I doubt if it can be put into competition with the valley of the Orontes or the Rumelian plain. That is why it has been used as a bridge rather than as the centre of a new power. Before I sit down, perhaps I might be allowed to refer to almost the last paragraph of the paper, the section in which Prof. Ramsay deplores the fact that those who go into Asia Minor have so soon to leave it. His own career has been a great example of what an extraordinary benefit it is to geographical knowledge that one person should be able to study one particular subject for a considerable time. We in England who do all these things by private enterprise, and have nothing to do with the Government in the matter, are very severely handicapped. It is only when these kind of enterprises are supported by a government that it is possible to carry them out with any continuity. I have nothing, not a word, to say against this Society, and nothing but praise for the members. The Society has most nobly helped the work in Asia Minor for many years, not only by making grants towards the actual travelling, but by the still more difficult and expensive work of supporting the publication. The great work Prof. Ramsay brought out some ten years ago, 'Historical Geography of Asia Minor,' is a monument both to himself and this Society. It is not for me to say one word about public bodies and the character of this Society, but I do wish something could be done by which the Government could be interested in this matter, and could secure to Prof. Ramsay, and people like him, some continuity for their work in a country like Asia Minor.

The PRESIDENT: With regard to the 'Cilician Gates,' isn't it the fact that Ibrahim Pasha opened it up?

Mr. HOGARTH: He opened the passage—made it wider.

Sir HENRY H. HOWORTH: The only possible claim that I have in any way to say a word upon this paper, is that I have written so much on the movements of the nomads, and that when quite a boy the very first papers that I published were on the "Westerly Drifting of Nomades," in which these same Seljuk Turks filled rather a conspicuous place. I cannot say what I have to say, which will be very short, without expressing my own personal gratitude for the extraordinary precision and clearness and compactness with which so many facts were condensed together in this paper, which was so desperately interesting to all of us. If I may raise one issue, it is more for the purpose of getting an answer from Prof. Ramsay than for any other purpose. The issue I would raise is this, that the civilization and the culture and the fertility of Asia Minor are all on its borders, and that the interior of Asia

Minor is now what it must always have been, very largely indeed, a country in which it was impossible to have a settled people at all—it must always have been a country of nomads. And you will notice a remarkable fact in the map before you, that the only town in the great stretch of country reaching from Sardes to Trebizond is Iconium. From the very earliest times you have had in the centre of Asia Minor, just as you have had in the centre of Spain, which is another case to add to the one that Sir James Bryce mentioned in Mexico, a great plateau where only nomads could really very largely exist; and consequently you find this curious fact—that every great set of invaders who came to Asia Minor plunged themselves into these central districts, and it was from here they made their raids and their conquests of the surrounding districts. It was so, I believe, with those Aryan nomades, the Cimmerians, who in the seventh century B.C. devastated Magnesia and the other coast towns of Asia Minor. The Galatians, who were in a somewhat nomadic state, also planted themselves, not on the coast, but in this same central plateau, and from this they made their invasions until they became more or less settled. It was the same with the later Turks. We must separate these Seljuk Turks from every other kind of Turk. Every beautiful piece of porcelain that comes from Western Asia, in nearly every case I have seen, comes from a Seljuk mosque or a Seljuk building of some kind. It is the fact that they were extremely amenable to a settled life that distinguishes them so absolutely from all the other Turks that one knows anywhere. The Turcomans themselves, who are their first cousins, and who now inhabit the great plateau, when the Seljuk empire was destroyed in 1260, broke up into ten small communities, and one of them became afterwards the great Ottoman empire. It grew out of one of these little fragments. This particular kind of Turk must be differentiated from all others by the fact that they were capable of forming settled communities, that is why they differed from the nomad Arabs. The Arabs had their great towns at Baghdad Damascus, and at Aleppo they had another; but the great mass were Bedouin, who were quite incapable of forming settlements in towns and of forming a great nucleus from which to fight a civilized power like the Byzantines. Also, no doubt, as Mr. Hogarth mentioned, their whole surroundings, the particular kind of camels they had, and the life they had led, made Asia Minor very difficult for them to settle in. We were only recently talking in the coin room of the British Museum of the fact that on many of the Asia Minor coins the camel is represented, but it is always the two-humped camel. In the time of the Greeks there must have been a large number of these camels, because they are so often represented on the coins. I consider the most interesting problem that has to be solved in Asia Minor is for some one like Prof. Ramsay to give us a work on the mythology of this country. It has been the fashion too long and too much to confuse the gods and goddesses of the various provinces of Asia Minor with the corresponding gods and goddesses of Greece by giving them names, sometimes double names, in which the native god or goddess is lost altogether in the Greek prototype, which we know very well. The fact of the matter is that the whole surroundings of this mythology were absolutely different to anything that we have in the Greek world, and there is nothing so misleading as this practice. There is no one who can do the work so well as Prof. Ramsay, if he would give us a monograph on this subject, and I hope he will be able to say he has something of the kind in contemplation. I am sure we all feel exceedingly grateful to him for his paper, and we hope it will only be a very short time before he gives us another.

Prof. RAMSAY: On the effect produced by the nomad Turkmen and other tribes I have laid special stress, while omitting the terrible Mongol raids, partly because the nomads have not been properly taken into account by any historian (except the original Byzantine writers), so far as I know; but also because the nomads were a permanent and earlier cause, while the destroying hosts of Tamerlane came and went, and the Roman cities which he annihilated might have revived, had not the nomads already isolated them from one another and paralyzed the circulation which makes the blood of the nation vital.

Mr. Hogarth's remarks about the difference in character between the high plateau north of Taurus and the low hot Cilician lands do not seem to me to conflict with anything I have said; they merely lay due emphasis on one of the causes which united to make Taurus a boundary. But his argument that, because the plateau of Asia Minor has usually been subject to an external empire, having its capital further east or further west, therefore that must always have been the case in the earliest times—that is an argument which I cannot accept; and Mr. Hogarth himself has recently been supplying a disproof of his own reasoning. Crete has been insignificant in history for nearly 3000 years; but now, thanks to Mr. Evans and himself, we have perfect corroboration for the Greek belief and myth that Crete was once a great centre of power and civilization. In the circumstances of the period between 3000 and 1000 B.C. (very different from later conditions), Crete and central Asia Minor stood in very different relations to the countries around; and the myths which speak of great kingdoms on the central plateau are confirmed and proved by the imposing ruins of Pteria, an imperial city, not a mere provincial capital.

Sir H. Howorth most justly praises the art of the Seljuk Turks, as I have often done, but there remains much to say as to causes. On the other hand, he has, I venture to think, exaggerated the barrenness and unproductiveness of the great plains of the central plateau. Those plains are marked as "désert salé" on the maps, such as Kiepert's; but this is quite false. The soil is almost everywhere good, and only needs the distribution of the water supply (which is frequently available) to make it a garden. It was covered with towns and even great cities in ancient times. Between Iconium and Trebizond (not to speak of such great cities as the present Kaisari, the ancient Cæsarcia-Mazaka) there were many important cities, Justinianopolis, Pteria, Sebastia, Neocæsareia, and a score or more of others. During last summer we found the site of Savatra, containing the ruins of a considerable city, with its own coinage and its theatre, where now it is physically impossible for more than a few nomads to find food and water.

But Sir Henry also has touched on a remarkably interesting subject, the distribution of animals and the relation of that subject to mythology and religion—a subject which I have very briefly alluded to in my rather desultory paper, but about which there is much to say. As he says, we were a few hours ago talking in the British Museum of the Anatolian camel. Now, contrast what he has stated about ancient times with the fact that at the present day the camel of Asia Minor is the one-humped Arabian, not the two-humped Bactrian camel.* What an amount of history lies in that one contrast! Here I cannot add more, but what is stated about the Anatolian systems of breeding in my 'Impressions of Turkey,' pp. 272-274, is enough to show how much may be expected from proper investigation by a more competent observer in the country. I have often longed for the company of a trained naturalist in Anatolia. In conclusion, I may say that I have long wished that the opportunity might be given me of making a proper study of the mythology and religion of Asia Minor; and that I am very grateful to Sir H. Howorth for the expression of his interest in that wish. I had written something more in this paper on the relation of land and religion, but had to omit it; and I may flatter myself that what I wrote was on the right lines, because it agreed with the spirit of what Mr. Bryce has said to-night.

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* The Bactrian camel is used in Anatolia only as a sire, and the offspring of Bactrian sire and Arabian dam is always mule.

In the course of my paper I spoke about my successors, junior to myself, but I omitted to mention, as I intended to do, my predecessors, and especially to say that it is to Sir Charles Wilson that my own explorations in Asia Minor are entirely due. It happened that on the day that my wife and I landed in Asia Minor, now almost twenty-two years ago, Sir Charles Wilson, who was at that time organizing the English Protectorate over Asia Minor, had come to spend two days in Smyrna, and I met him on the day I landed. And it was owing to his example, to his teaching, and to the way in which he invited me to accompany him on two journeys and showed me in practice and in theory the ways of travelling and investigation and surveying—it was entirely due to this cause that my own explorations were directed to that part of the country. I felt it to be unfair to speak only of my successors, and to have omitted entirely to refer to the origin of my own work on the subject.

The PRESIDENT: In closing the discussion, I should like for a moment to refer to the early geographers who have worked in Asia Minor. The greatest geographer this country ever produced, Major Rennell, devoted many years to the study of what could then be known of the geography of Asia Minor in order to elucidate the March of the Ten Thousand and other historical points. The earliest of our modern travellers in Asia Minor was Mr. Hamilton, whose accuracy of observation would be testified to, I am sure, by every one who has gone over his ground, and he was a President of this Society.* One of our oldest vice-presidents, and the one who was for the greatest number of years vice-president, was Colonel Leake, whom I think Prof. Ramsay mentioned as the greatest of modern topographers. Since his time we have endeavoured to help the work of exploration in Asia Minor, and the result has been Prof. Ramsay's great work on the geography of the country, and his paper this evening, which I cannot help feeling is the forerunner of something much more detailed in every branch of the subject, which I am sure we all hope may appear in the course of time. The paper is full of suggestiveness—nearly every paragraph makes you want to know more on that particular point, and therefore I think we may hope that before many years have passed we shall have more complete information from Prof. Ramsay on each point that he has touched upon in the paper. I think it must have struck us all how very much history owes to accurate topography. In Prof. Ramsay's paper he spoke of that secondary Paphlagonian valley, the history of which can only be elucidated by the study of its topography, and still more that glen which he mentioned, and which, as I understood him, is the key to an accurate knowledge of the March of the Ten Thousand. It was always a puzzle in what direction Xenophon marched until that particular glen was discovered, when the whole story became perfectly clear. There are one or two other instances in the paper showing the great importance, as Mr. Bryce has pointed out, that accurate geographical knowledge is to any one who wishes to elucidate or understand history, and especially ancient history. But the subject is full of interest, and I am sure you will all wish to pass a cordial vote of thanks to Prof. Ramsay for his paper this evening.

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* Hamilton is styled "the prince of travellers in Asia Minor" by Prof. Ramsay.

THE CAURA AFFLUENT OF THE ORINOCO.

By E. ANDRÉ.

PART I.—THE CAURA.

IT was in September, 1897, that I paid my first visit to the Caura. On that occasion I had not intended, when I left Trinidad, to be away for more than a couple of months, but I got so interested in the bird-life of the region that I did not return until May, 1898, having spent very nearly eight months on the trip. The furthest point reached then was the island of Cangrejo, just beyond the rapids of Piritu. With the exception of a journey to the mountain of Turagua, which I have described separately, I was all the time in the immediate vicinity of the river itself. During that first visit I collected a considerable number of birds and some orchids. *Cattleya superba* and *Epidendrum Stamfordianum* were the principal plants obtained. Among the men who were with me during those eight months were three Indians from the headwaters of the Caura. One of these men was a new arrival, but the others had been knocking about the Venezuelan settlements for years, and in consequence spoke enough Spanish to make themselves understood. During the frequent conversations I had with these men, I acquired a good deal of information about the country from which they had come. I have referred to this first trip because it led to the expedition undertaken in 1900, the results of which I shall try to embody in the subjoined article.

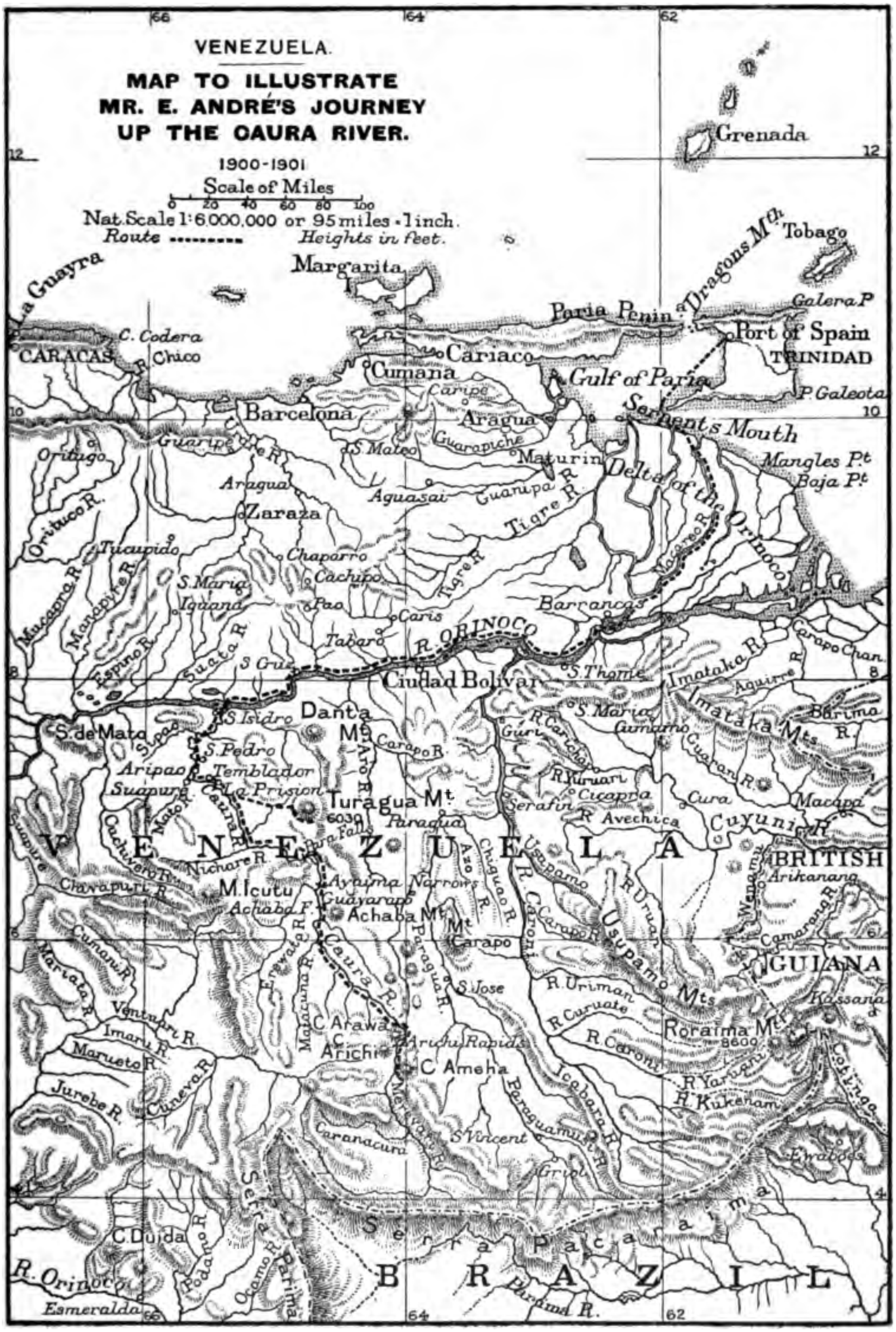
As far as Temblador the ascent of the Caura does not present any serious difficulties. In fact, during the rainy season flat-bottomed steamers, even of considerable size, can perform the journey without more risk than attends the navigation of the Orinoco. But beyond Temblador it is impossible for large craft to ascend the river; even in dug-outs its navigation is difficult and dangerous. No doubt it is owing to these difficulties and dangers that the country above this settlement has been so little explored. For the last 40 or 50 miles of its course the Caura flows through rolling plains covered with grass, with belts or patches of forest growth along the streams and in the hollows. These open rolling plains are part of the region of the *llanos*, bounded on the north by that spur of the Andes forming the seaboard on the Caribbean sea, and on the west by the eastern cordillera of the Andes themselves. From its source to Aripao, at which place, roughly speaking, we may say that the *llanos* commence, the Caura flows through one vast forest. This part of Venezuela is known as "*La zona de los bosques*," the region of the woods. According to the accounts of the Indians, only two small *llanos* occur in the whole of this forest region of the Caura—one in the vicinity of the Nichare, the other near the sources of the Caranacuna.

The country on the banks of the Caura from its mouth to the rapids of Mura is but thinly populated. With the exception of Maripa, scarcely any of the other places can aspire to being called villages; they are merely clearings where rice, sugar-cane, bananas, and a few ground provisions, such as sweet potatoes, manioc, and yams, are grown, with huts scattered here and there for the accommodation of the settlers. At San Isidro and San Pedro there are a few Indians, but they do not appear to belong to any particular tribe. With the exception of these Indians and the small settlement of Waiomgomos, at the rapids of Mura, the inhabitants are Venezuelans, and they are of every shade of colour. These people speak nothing but Spanish. Their principal occupation is collecting tonca beans, the fruit of *Dipterix odorata*. They also do some business in cedar and copaiba oil.

Within recent years there has been a steady decline in the price of tonca beans, which at one time fetched as much as four dollars the pound in the New York market. If I am not mistaken, the value of these beans to-day does not exceed sixty cents. Of course such a decline in prices has seriously affected the people on the Caura, to whom the tonca bean, or *sarrapia* as they call it, means everything. Whereas in former years but little rice was grown, I should say barely enough to meet the requirements of the settlements, to-day there is a considerable surplus, which finds its way to Ciudad-Bolivar. The increase in the cultivation of this grain is the outcome of the decline in value of the product upon which the inhabitants of this part of Venezuela depended for their existence.

In the neighbourhood of the settlements are many hills, some isolated mountains and mountain masses, and a range of considerable extent—the Serrania de Mato, which can be seen from Suapure. All the mountains and hills which I visited during both of my trips are of granitic formation. In fact, all over the district granite predominates. Huge detached masses of this rock are quite common in the middle of the forest. Then there are those open spaces called *lajas* by the natives, and which are nothing else but excrescences of what I cannot help believing to be one extensive substratum of plutonic rock. The same remarks apply to the islands which encumber the Caura, and are the cause of its navigation being so difficult.

Between the mouth of the Caura and the falls of Para the land rises gradually, but the difference in altitude, although of small account, is sufficient to cause the current of the river to be rapid. Mura and Piritu are the places where this incline in the bed of the stream makes itself most felt. The falls of Para constitute a formidable barrier to the navigation of the Caura. Just above the falls the river divides to form an island of between 7 and 9 miles in length. By a succession of cataracts, the two streams rush through gorges on each side of the island to meet at its foot. The right-hand stream is of much greater volume than that on the left, which, after a severe drought, dries almost



VENEZUELA.

MAP TO ILLUSTRATE MR. E. ANDRÉ'S JOURNEY UP THE CAURA RIVER.

1900-1901

completely up. Where the streams meet there is a large deep pool. When the river is low this pool is calm, and its banks are stretches of beautifully white sand, with backgrounds consisting of huge masses of black rock supporting in places a vegetation of flowering shrubs and orchids. It is then a lovely, peaceful-looking spot, even the roar of the falling water being subdued. I must confess that when I saw the falls for the first time I was disappointed. Although the scene was beautiful, it was not the picture I had conjured up when the Indians had described with bated breath the grandeur of Para. The island which divides the river is densely wooded. It is over this island that the portage of the boats was effected, a work which occupied seventeen days. A track having been cut through the forest, round logs were placed crosswise on the ground. The boats were then hauled over these logs by means of pulleys, one attached to the head of the boat, the other to a tree some 20 or 30 yards in front. Had I not brought the pulleys and a coil of strong rope, we should never have succeeded in getting the boats over the island. The first part of the portage is the worst, for the hill rises abruptly from the pool up to 600 feet; then there is a plateau broken by hollows in three places. We had to build two bridges over deep ravines, which added to the difficulties of the undertaking. At last, after seventeen days spent on the island, we were able to continue our journey. The plateau where the falls begin is about 1000 feet above sea-level; so that the land at this spot rises about 800 feet, that is, taking my barometer-readings to be correct. The bed of the stream, for a considerable distance after leaving the falls, is encumbered with islands and masses of rock. At one spot a ledge of granite over 200 yards in width runs across the river, forming a dam over which the current rushes with violence. It took us a whole day to haul the boats over this obstruction. A couple of days' journey beyond the falls are the narrows of Ayaima, one of the most picturesque spots of this picturesque river. The whole volume of the Caura rushes through a gorge not more than 30 feet wide. Above and below this gorge the river expands into large pools dotted with islands. Beyond Ayaima the Caura flows by a perfect labyrinth of channels through hundreds of islands. The place is called Guayarapo, and is most difficult to navigate, being a succession of dangerous rapids. The next serious obstruction in ascending the river is met with at Achaba, where a series of falls necessitate a portage through the forest, but the portage is a short one. From these rapids we had a good view of the mountain of Achaba. It was the first we saw of those flat-topped masses with precipitous sides which form so extraordinary a feature of the landscape of the upper Caura. Above Achaba the river is broad and deep for a considerable distance. Then there are the rapids of Suraima, beyond which the river is again broad and deep.

From the rapids of Arichi can be seen the mountains of Arawa and

Ariohi, while in the distance, veiled in bluish haze, the outline of Améha can be just dimly discerned. It takes three days to paddle from Ariohi to Améha. Where the Caura, or rather the Merevari, flows past the mountain its banks are 1500 feet above sea-level. From the river the cliffs look so near that one would scarcely believe that it takes a day and a half of steady walking to reach them. Before getting to the slope leading to the precipice, a belt of low-lying tangled growth has to be traversed. The trees of this growth are stunted, and their branches twisted and unshapely. They are covered with mosses and parasites, and appear to be always dripping with moisture. Besides other plants, I noticed two sorts of begonia, some caladiums, and a sobralia. Mounds or hillocks are scattered over this low-lying strip of land. Although the elevation of these mounds or hillocks above the surrounding country is but slight, the vegetation which clothes them is different. In this stretch of low-lying land, interspersed with hillocks, we obtained, in addition to some other birds which I do not know, a remarkably handsome partridge and a quail. Although we found the bald-headed cotinga (*Gymnocephalus clavus*) to be common enough, we did not secure many specimens. The Indians call this bird *koa*, which sounds very much like the Demerara name "quow." The little adouri (*Dasyprocta acuchi*) is one of the commonest of the smaller mammals.

Where the land begins to rise, and for a distance of, I should say, speaking roughly, 2 miles, the ascent is gradual and regular. Close to the cliffs the incline is so steep that we frequently had to crawl on our bellies. We had met with some enormous masses of rock on our way, but along the base of the precipice we found such masses to be quite plentiful. For three days we wandered about the foot of the cliffs, but we did not make much progress on account of the *débris* we encountered almost everywhere. The general colour of the cliffs is a yellowish-grey. In one place where a huge piece of many thousand tons had been recently detached from the main mass, the colour of the freshly exposed surface was a bright red. Probably this after a time would assume the same yellowish-grey tint which is the prevailing colour of the cliffs. The men had built two huts at some distance from the precipice, and there we slept and did our cooking. On the last night of our stay near the cliffs, we witnessed one of those terrific storms which during the rainy season are of daily occurrence on all these mountains. Up to about one o'clock the night had been oppressively still, so still that there was not even a rustle amongst the leaves. In the fitful sleep which I had had up to then, I had noticed every time I woke how black and quiet it was. The first intimation we got of the approaching storm was a blinding flash of lightning, accompanied by a clap of thunder so loud that we all sprang out of our hammocks. Almost simultaneously with the thunder came strong gusts of wind, causing our huts to sway from side to side so that I expected to see them blown down at any moment. Flash of lightning followed flash with scarcely an interval between the flashes. All the time there was an almost continuous roar of deafening thunder, which made the ground tremble beneath us. The rain came down in torrents, and the wind had increased to such a gale that heavy branches were being snapped off in every direction, while now and again some old monarch of the forest, unable to withstand the force of the wind, would come down with a terrific crash. The men assembled in the largest and strongest of the huts. All we could do was to remain in one place and hope that no tree would fall upon us. Old Maite, the Indian, was in a terrible fright. Whenever there was a lull in the storm which allowed his voice to be heard, he would tell us stories of the wicked spirits who inhabit these mountains, and how they got angry whenever men invaded their precincts. It would have been folly to have tried to explain to this hardened believer in gnomes and demons the phenomena of a thunderstorm. How long this battle of the elements lasted it would be hard to say. Probably we exaggerated its duration. The storm ceased almost as suddenly as it had commenced. A few gusts weaker than the others, and the work of destruction was being carried on lower down, the thunder dying away in the distance.

When I first explored the mountain I was struck by the size and number of the branches strewn about the ground, but after having witnessed one of these storms I found no difficulty in accounting for this state of things. The rainfall at Améha and in its immediate neighbourhood is, I should say, very much greater than that of the surrounding country, and that is saying a great deal considering that in these equatorial forests the rainfall is heavy. In fact, the vigorous vegetation existing over a great part of tropical America depends for its luxuriance on the torrents of rain which for nearly three-fourths of the year are of daily occurrence.

The time to see Améha in its glory is immediately after a heavy shower. The waterfalls, which dwindle away to mere threads after several days of dry weather, are then in all their grandeur. Even at our camp on the banks of the Merevari it was possible, on occasions, to hear the roar of the falling water. The Indians never tire of telling stories about the mountain. Quite a number of legends have been handed down respecting it. On its summit is a large lake, so deep that it cannot be fathomed, and its waters are the abode of strange gigantic creatures not found elsewhere. Gnomes and demons dwell amongst its inaccessible crags, and they it is who cause the lightning, the thunder, and the wind. I very much regret that during my stay at Améha I did not succeed in getting to its summit, but I hope to be able to do so some day. What rich fields for the naturalist and botanist must the tops of these inaccessible mountains be, isolated during countless ages from the country beneath!

We left Améha on April 24. On the 27th the large boat which carried my plants, the seeds, insects, herbarium specimens, samples of rock, and birds collected during the journey, was wrecked in the rapids of Arichi. It would not be within the scope of this article to give a detailed account of the sufferings we endured between the day when we lost our boat and our arrival at La Prision on May 23, twenty-six days after. It is sufficient to mention that out of fourteen men only eight reached the settlement alive.

With the exception of the few Indians living at the rapids of Mura, a distance of about 3 miles above the settlement at La Prision, no human habitation is met with either on the Caura or the Merevari until the large Waiomgomo house or compound on the slopes of the range forming the boundary with Brazil, near where the Emecuni rises, is reached. For a distance of over 200 miles as the crow flies, and for double that distance following the windings of the river, there is nothing but a wilderness of uninhabited forest. It was not so when the Spanish missionaries visited the country and established a station at the mouth of the Erewato, above the falls of Para, which they called San Luis de Erewato. Many tribes then dwelt on the banks of the Caura, but within the short space of time which has elapsed since these tribes came in contact with white men, they have been completely blotted out. Such has been the fate of the American Indian all over the Western Hemisphere. He cannot live alongside the European or his descendants.

Of the numerous tribes which dwelt on the Caura and in its neighbourhood, only the Waiomgomos have survived, and they also, although so far removed from civilization, have, according to Isidor's accounts, decreased to an appalling extent within a comparatively short period. To-day the compound on the Merevari range does not contain more than fifty or sixty people, of whom about two-thirds are women. They are polygamous, some of the men having two or even three wives. In the few books I have read dealing with the Indians of Guiana, these people are referred to as Maionkongs. They call themselves, however, Waiomgomos. I was particularly careful to satisfy myself on this point, and I even mentioned the word Maionkong to Isidor as being the name by which his tribe was known abroad. He told me that the Indians through whom his tribe received such articles as knives and fish-hooks from British Guiana, spoke dialects so different to that of the Waiomgomos, that they would probably find it almost impossible to pronounce certain words correctly. To this must be added the difficulty attending the rendering of names from a language entirely different in structure to any European one, without taking into account the carelessness with which names and words are very often jotted down by travellers.

The Waiomgomos at Mura, who come in frequent contact with

Venezuelans, have added something in the way of dress to what they were accustomed to at the headwaters of the Merevari. The women are very fond of bright-coloured cloth, a piece of which they wear tied over one shoulder so that it hangs down and covers the breasts. Beads are the favourite ornaments of both men and women. The men, while working, wear nothing but a strip of blue cloth passed between the legs and fastened to a string tied round the waist. To receive us, they always dressed, if the wrapping of a piece of cloth around the body can be called dressing. A long strip of the same cloth is sometimes passed over the shoulders and under the arms in many folds. Both men and women paint their faces and bodies a brick-red, using annatto, and the effect produced when they are well painted is pleasing. The Indians of the distant village on the Merevari do not use annatto, but a pigment obtained from a creeper unknown on the lower Caura. The colour of this pigment is a bright scarlet, much brighter than that of the annatto.

With the exception of rice, which the Indians at Mura have only recently begun to cultivate, and which has not reached the villages on the Merevari, the articles grown, the methods followed in agriculture, the preparation of cassava and *yaraqué*, are similar in both places. The manufacture of cassava cakes from the poisonous manioc (*Manihot utilissima*) has been so frequently and fully described that a detailed account of the process would be a waste of time. *Yaraqué* is the fermented drink made from the cassava, and it is known under different names all over Guiana. Ordinarily, *yaraqué* is prepared only in sufficient quantities every three or four days to meet the requirements of the household. Banana leaves are placed on the ground in a corner of the hut, and upon these leaves the cassava, thoroughly damped with water, is spread in layers. On each layer a powder of a sage-green colour is sprinkled. This powder is called *yaraquéro*, and is prepared from the leaves of a plant of the same name (*Trema micrantha*). The preparation of this powder is simple. The leaves, having been dried on the large slab used for baking cassava, an operation which does not take long, are then reduced to powder by being rubbed between the hands. This powder is kept in well-stopped gourds, as there is a minute red ant which is very fond of it, and will find it out wherever it may be hidden. The mass of damped cassava and *yaraquéro* is then covered over with banana leaves and allowed to ferment. At the end of two or three days the mass becomes slightly sour. In this state it is either eaten or drunk mixed with water and cane-juice. If allowed to ferment for more than three days, it becomes intoxicating. Large quantities of *yaraqué* are consumed during the dances which form part of almost every celebration among the Indians. On these occasions the stuff is prepared on a big scale, generally in dug-outs.

The agriculture on the clearings is carried on in the most primitive manner. One day I saw one of the Indians planting maize. With a pole sharpened at one end, he walked along, digging little holes at intervals. He was followed by a boy, who dropped a few grains of maize in each hole, and then threw some earth over the grains with his foot. I was often struck by the dexterity with which these Indians use their feet for picking up any small article they may have dropped. Besides food-stuffs, cotton is always grown on the clearings; it is used principally in the manufacture of hammocks. For animal-food, the Indians depend entirely on hunting and fishing. They are very expert fishermen with the bow and arrow, but they also fish with spears and hook and line. All game and fish which have to be kept from one day to the other are smoked. Like most South American Indians, the Waiomgomos are impatient of any sort of control. They are, moreover, an exceedingly unreliable people. In structure they are short, but well set and muscular. They can eat enormous quantities of food when food happens to be plentiful. In fact, they get up frequently during the night to eat. This habit of gorging is acquired during early youth, when the children are allowed to eat as much as they can—that is, when food is abundant.

In the immediate vicinity of the settlements the larger game animals are scarce, although now and again a tapir is killed. Bands of peccaries sometimes visit the provision gardens, when several are killed, but this is not a common occurrence. The howling monkey (*Mycetes seniculus*) can be heard almost every day in the morning quite close to the clearings. It is only after passing Cangrejo, however, that game may be said to be plentiful. Between the falls of Para and the mountain of Améha six tapirs were killed, and we could have secured many more had we not been in a hurry to reach the mountain. Curiously enough, on our return we saw only one tapir. It is true that the river had risen considerably, and as the hollows in the forest had water, the animals were not obliged to visit the river. The tapir appears to be more abundant in the vicinity of rapids than elsewhere. And this would appear to bear out the statement of the Indians that these animals feed largely on an aquatic plant which grows in abundance in places where the current is strongest. The plant is *Neolacis corymbosa*. At first sight this neolacis, so soft and delicate, appears out of place, growing as it does exposed to the full force of rushing water in places where a man can barely stand if he attempt to wade up to his knees. But if the plant be closely examined, it will be seen that, while the stems and leaves are soft and pliable and yield to the force of the current, the roots are hard and wiry, and cling with such tenacity to the surface of the rocks that it is almost impossible to remove the entire plant. Any attempt to do so resulted, as I found, in the breaking of the stem at the point where it springs from the roots. This neolacis exists only under water. With the falling of the river the exposed plants die, leaving a network of white thread-like roots with sharp points, where the stems have dried up. If tapirs feed largely on these aquatic plants, as the Indians affirm, their elongated snouts would be of great use in tearing off the succulent leaves and stems from the uneven surface of the rocks to which the plants attach themselves. Even commoner than the tapir on the banks and islands of the Caura is the capybara (*Hydrochærus capybara*). We frequently met with whole families of this huge rodent. They are expert swimmers and good divers, but they cannot remain long under water. Of the larger carnivora during the whole trip, I saw only two pumas and heard one jaguar.

The whole of this region over which I travelled is particularly rich in bird-life. It is unfortunate that the collection made above the falls of Para and at Améha should have been lost, as I have no doubt that it would have proved an exceedingly interesting one. About nine hundred birds collected in the neighbourhood of La Prision and on the Nichare were sent to the Tring Museum, and I understand from Dr. Hartert that they will be incorporated in a work now being published on the birds of the Orinoco, a publication which is sure to be of interest to ornithologists.

The large alligator is not found beyond the falls. It is replaced by a much smaller species, called *bava* by the natives. The electric eel (*Gymnotus electricus*) and many fishes abundant in the lower reaches of the Caura do not occur in the river above the falls. On the other hand, the *Aymara*, a large fish with sharp powerful teeth, common above Para, has never been caught, at least so the Indians say, in the river below.

What are the possibilities of the Caura? Its banks are clothed with many valuable tropical woods and forest products. On the Nichare there is an abundance of a *Micrandra*, of which Dr. Britton wrote in September, 1898—

"Referring to the sample of rubber gum, and the accompanying specimens of the foliage and flowers of the tree which you described to me as producing them, I would say that I am informed by Dr. John K. Small, curator of the Herbarium of Columbia University, that the tree is a species of the genus Micranda, natural family Euphorbiaceæ, closely related to the same genus Hevea. It appears from Dr. Small's studies that the species comes nearest to *Micrandra siphonioids* of Brazil, but that it is probably different, and most likely is an undescribed species. All the Micrandras hitherto known are Brazilian."

In a report subsequently made on the rubber obtained from this tree, samples of which had been sent to New York, it was described as being equal to medium Para.

Leaving out of consideration the difficulties attending the actual navigation of the Caura, there remains a reason why any attempts to ork the rubber tracts on the Nichare are almost certain to meet with failure, and that is the utter absence of any population whatever above the rapids of Mura. Should settlements be established as far as the falls of Para, it might be possible to work the undoubtedly rich rubber region which exists on the Nichare with success. Until then even voyages of exploration can be undertaken only at considerable risk.

PART II.—ASCENT OF TURAGUA.

One of the most striking features of the landscape of this part of the Caura is the mountain of Turagua. Immediately after leaving the Mato one can get a good view of it, and from the *lajas* in the forest and the islands in the rapids its triple crest presents an imposing appearance. It is one of those mountains which one feels a longing to climb. In the March of 1898, I got the three Indians who were with me at La Prision to cut a track to its base, a work which took them nine days to perform. I think the trip worth while describing here, although it formed no part of this expedition.

March 11, 1898.—The Indians came early. It was a raw, drizzly morning, with heavy banks of clouds piled up towards the east and appearing to almost touch the tops of the trees. Such threatening weather denoted abundance of rain, and I knew that we would be soaked through and through before getting very far. Nevertheless I decided to start at once, for the trip had been forcibly put off so often, that it seemed at one time as if some strange fatality stood in the way of our long-contemplated journey to the mountain. No time was lost in preparing the packs. Oval frames about 3 feet in length, made of thick pieces of pliable creeper with strips of bark woven between, had been prepared. The articles to form the pack were placed between two of these frames, which were then securely tied together. Each pack weighed from fifty to sixty pounds, and was carried by a broad band of bark stretched across the forehead, the pack resting on the shoulders and back. Several kinds of bark are used in Venezuela for this and various purposes. From the *majagua* (*Hibiscus tiliaceus*), which is common in many parts of the country, good cordage is made. In the northern mountain range, where all the traffic is performed by pack-animals, the trappings of the donkeys and mules are usually plaited from the bark of this hibiscus. The word *majagua* is used indiscriminately in speaking of the tree or the bark obtained from it. On the Caura two sorts of bark are employed, one is called *coco de mono* (*Chytroma rosea*), the other *cabeza negra* (*Apeiba Tibourbou*). These barks, being pliable and strong, are put to many uses by the Indians and Venezuelans.

The method of carrying loads by a broad band across the head is common to most of the American tribes. In certain parts even men and women are carried across the mountains in chairs in this manner

Throwing the body slightly forward, the carriers proceed at a jog trot, and thus cover long distances with a considerable weight.

When we filed out of the settlement our party consisted of the three Indians, Isidor, Maite, and Silvestre, Raoul Turban (a taxidermist), and my boy, Guy. The moment an Indian comes in contact with Venezuelans he adopts some Spanish name. Maite is a corruption of Mateo, and not an Indian name, as one might suppose on first hearing it. Sylvestre, who had come from one of the Waiomgomo villages on the Parima mountains only a month or so before my arrival, had been named immediately by the others. I never could induce Isidor or any of the others to tell me their Indian names. All the Indians of Guiana appear to have the same objection to divulging to strangers the names by which they are known to their immediate relations. It was about nine when we passed the last house at the edge of the clearing and entered the forest, and we agreed not to stop before reaching a place called Esperanza, where the tracks of the *sarrapieros* end, and the trail opened by our Indians began. By the time we got to the *Laja de los Perros* * the rain had increased to a steady downpour. Near to this *laja* a huge slab of rock resting on two upright masses forms a natural shelter. Old Wachee, one of the La Prision *sarrapieros*, and his wife had taken possession of this rocky protection from the weather. They were collecting tonca beans, for the crop was then at its height, and most of the people from the settlement were staying in the forest. We stopped at this natural *rancho* and had a chat with the old man and his wife. They were a dilapidated pair. In the days of his youth the man, who, I was told, had been of a turbulent disposition, had had frequent misunderstandings with his neighbours, especially on feast days when the rum-bottle had been circulated more freely than wisely. In one of his encounters he had suffered considerable damage, not the least of which had been the loss of an eye. The woman was a victim to that curse of the Caura, ulcers on the legs. One of these ulcers had eaten deep down into the very bones of her right ankle, and had so crippled her that she was unable to walk. In spite of her affliction, she followed her one-eyed husband for many long miles into the woods, slowly dragging herself on one leg. The sight of this couple, stricken with age and disease, forced to wander about the forest so as to obtain a living, was painful in the extreme. After leaving this scene of misery we proceeded in the direction of the *Laja Grande*.† Many *ranchos* had been built in the vicinity of this *laja*, for its size and the flatness of its surface offered great convenience for the preparation of the beans. We could hear the *sarrapieros* shouting to each other as we followed the narrow path through the forest. We passed three of their huts, but did not stop. The trail lay almost due east, and except where a curve had been made to avoid some obstruction, such as a fallen tree, it was straight enough. We trudged wearily along, keeping our eyes down so as to avoid being tripped up by the network of roots and creepers with which the ground was covered. Several streams, some with mud, others with sandy beds, had to be crossed. At first I took my boots off whenever we came to one of these streams, but I soon got tired of this repetition of taking off and putting on my socks and boots every ten minutes, and I resolved to leave them on until we should reach our camping-place. It was all right when the bed of the stream happened to be of mud or earth, but where it was sand, and my boots got filled with particles, I still had to take them off and wash the grit out, or I should have been unable to continue walking. At about one o'clock we halted on the banks of a broad clear stream and had something to eat. The Indians had brought ripe bananas, fresh cassava bread, and boiled turtle-eggs. Off these we made a hasty meal, and then continued our journey. We had got beyond the district where the *sarrapieros* conduct their operations. Within the memory of the people at La Prision no one had ever gone further than the *sarrapial* of Esperanza, and there were no tracks beyond the spot except the newly opened trail made by our Indians. The masterly manner in which the cutting of this trail had been performed was really astonishing. In the thickness of the forest, where it was impossible to see anything 50 yards ahead, these men, without a compass or any other instruments, had succeeded in opening a road to the foot of the mountain, of which even a trained surveyor might have been proud. No deviation from an almost straight line marred the accuracy of their work. It was evident, from the quantity of game we came across, that we had got beyond the haunts of the people on the Caura. Although we were far from being a silent lot, and the men, in getting through the narrow path with their packs, made a good deal of noise, yet we surprised a number of the larger game birds which are so difficult of approach near the settlements. These birds, so wild in the vicinity of La Prision, never having been disturbed in this locality, are quite stupid. I could have shot several curassows had we not been in a hurry to get to a good camping-place before nightfall.

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* "The Rock of the Dogs."

† "The Great Rock."

Two varieties of carassows are common in these forests. Both varieties are called without distinction *Pauji*; but when the natives wish to draw attention to the different kinds, they speak of them as *Culo blanco* (*Crax alector*), and *Culo colorado* (*Mitua mitu*), on account of the difference in the colours of the feathers of the belly in each species. These two curassows appear to have similar habits. Both utter the same shrill note of alarm on being disturbed, and they make the same deep humming noise when calling to each other. I have never been able to notice any difference in the humming of the two kinds, although the native hunters pretend that they can tell one bird from the other by its call note. But as it has happened on more than one occasion, that a hunter, after declaring, upon hearing a bird calling, that he was going to kill a *Culo blanco*, has brought back a *Culo colorado*, I have come to the conclusion that the natives cannot, as they pretend, always distinguish between the call notes of the "white" and "brown" posteriors, as they have, with more reason than delicacy, elected to distinguish the two varieties. During the mating season, in the unfrequented parts of the forest, especially along the banks of the streams, the deep hum of the *Paují* may be heard at almost any time of the day. But it is just before sunrise, and in the early hours of the morning, that the *Paují* appears to be most disposed to hum. It is impossible to describe in writing the peculiar noise which these birds make. The native hunters imitate the *Paují* by saying, "*El muerto esta aqui*" ("The corpse lies here"). It is while uttering in a deep tone this lugubrious chant that the *Paují* usually meets its death, for the hunter can then easily track it to its retreat, when it falls a victim, as the people say, to its own death-song. If the *Paují* gets suspicious it immediately ceases humming, and that is an indication to the hunter that the bird has seen him or scents danger. In such a case the only thing for the sportsman to do is to remain perfectly still. The bird may get reassured after a while, when it again begins to call, and it can be then stealthily approached and killed. If wounded only, the *Paují* usually succeeds in getting away. As these birds pass a part of their lives on the ground, they are fleet of foot, and as they are, moreover, of muscular build and plucky disposition, if not killed outright or very dangerously injured, they make good their escape in the dense undergrowth of the forest. The food of the *Paují* is very varied in its character. It consists principally of the fruits and berries of the forest, of certain kinds of which the birds are passionately fond. Like the domestic fowl, the *Paují* is also much given to scratching among the decayed leaves on the ground in search of worms and insects. On more than one occasion I have seen these birds on the rocky islands in the rapids and on the banks of the rivers, apparently feeding on the small snails which in certain places are fairly abundant. During the mating season the males are prone to be pugnacious, and they engage in combats which sometimes result in the serious injury of one or both combatants. Isidor assured me that he had once come across two male *Paujís* engaged in one of these encounters. So engrossed were they with their fight that they paid no attention to him and he was able to observe them for some time. Eventually he secured both. They were so exhausted and injured that they made no attempt to escape when he put a stop to their duel. The same Indian told me that another but very much rarer *Paují* inhabits the forest on the Caura, but as it is nocturnal in its habits, and retires during the day to some deep hole which it has burrowed in the ground, it is but rarely seen. No serious attempts appear to have been made to domesticate any of the curassows, although they take very easily to captivity, and become quite tame. I have not heard of any case of their having been induced to breed in a state of domesticity. It is a great pity that persistent and intelligent efforts have not been carried on in this direction, as the addition of these handsome and valuable birds to the other regular denizens of the poultry yard would be most desirable.

It was near sunset when we stopped for the night. While Maite and my boy Guy were preparing dinner, Isidor and Sylvestre constructed a *rancho*. Poles were lashed to four trees in the form of a square at a height of about 8 feet. Upon these poles others were placed as rafters. A thick covering of palm branches formed the roof. Either palm branches or the long broad leaves of the wild banana are used for this purpose. Our *rancho* was completed in less than half an hour, and when our hammocks had been slung between the trees under the thick covering of palm branches, the place looked quite snug with the big log fire burning in front of it. Close to our hut one of the men, while collecting firewood, came across the fresh excrement of a full-grown jaguar. The conversation immediately turned upon tigers, as the jaguar is called all over South America, and their doings. Each man had some story to tell of the cunning and audacity of the tiger, and the speaker usually happened to be the principal figure in the story which he was telling. Isidor was an easy winner in this competition of, I am afraid to have to admit, imaginary tiger stories. As he could speak Spanish fairly well, he not only told of his own adventures, but he interpreted the tales of his two friends, and put the finishing touches to them, so as to render them more impressive. It may appear strange that men of the same race who came from villages fairly near to each other should have been utterly unable to carry on a conversation of even a few sentences. Such, however, was the case with Maite and Sylvestre. So different were the dialects of these men, one of whom had come from the mountainous country at the sources of the Erewato, and the other from the Pacaraima range, that they could not exchange even the simplest ideas. It was amusing to observe their futile attempts to carry on a conversation when Isidor, who spoke both dialects and interpreted for them, happened to be absent.

The fact of the members of a small village consisting of but comparatively few individuals speaking a dialect peculiar to themselves is not uncommon amongst the Indians of Guiana. Probably the difficulties of communication in this country of impenetrable forest may, to a certain extent, be responsible for the existence of so great a number of dialects. The prevalence of long-standing blood-feuds between neighbouring villages may also, by the isolation which they tended to produce, have contributed to these divergences from a common language.

As Isidor and his companions told their stories in the ruddy glow of the wood fire, using in their excitement many forcible gestures, they so impressed my boy, Guy, that he got up and removed his hammock from the outer part of the *rancho* where he had slung it, and he begged me to allow him to sleep between the Indians and myself. He was resolved that he, at least, would not be made a meal of by the jaguar, a token of whose presence in the neighbourhood we had seen on our arrival.

Towards midnight it rained heavily, and we congratulated ourselves that we were under shelter.

March 12.—Isidor and Sylvestre were astir early, and woke me by their movements. They were splitting wood, with which they made a torch, while I watched them lazily from my hammock. Although it was quite dark, many curassows were calling in the forest around us, while now and again a tinamu would utter its long-drawn tremulous note. The Indians, having completed their arrangements, started out together. Isidor carried my twelve-bore, while Sylvestre went in front, holding aloft the torch they had made, which cast a bright glare around. They had not been gone many minutes, when a report, followed by a thud, told me that they had succeeded in killing a curassow. After a short while they fired again. When they returned to camp they brought two *Paujis.* They could have shot more, they said, but why waste powder and shot when we had enough game for breakfast and dinner? Indians are, as a rule, poor shots with a gun, yet they rarely miss. I have never seen Isidor or any of the others attempt to fire at a bird on the wing. Why should one fire at birds flying, with a chance of missing, when they can be stalked and potted with certainty at short distances? Powder and shot are commodities too valuable to be wasted in practising difficult shots. But if the Indian be but a poor marksman with a shot-gun, he more than makes up for his lack of skill by his ability as a tracker and hunter. No Indian thinks of wasting a shot until he gets to within but a few yards of his victim.

We made a hasty meal off biscuits and tea, and continued our tramp towards Turagua. The leaves of the undergrowth were dripping with water from the previous night's shower, and we were soon wet to the skin. Almost immediately after leaving our camping-place we got to a part of the forest which the Indians told me had taken them nearly two days to cut through, although I do not suppose that this belt of matted vegetation could have been more than a couple of miles wide. Of the extent of its length we were ignorant. These belts or tracts of tangled creepers and bush are called *bejucales.* They are the dread of all those wanderers in the woods who make a living either by hunting or collecting forest products. Woe to the wretch who gets lost in one of these mazes of interminable creepers—creepers from the size of one's leg to the thinness of thread—running along the ground, climbing up over the tops of the tallest trees to return again, striking their roots into the damp spongy soil, and with renewed vigour branch away in every direction, a regular spider's web for the poor devil lost in its interminable toils. The *bejucales* are the favourite haunts of tortoises and armadillos. Peccaries, also, are fond of visiting these cool damp resorts where the ground is spongy and soft, and they can dig as much as they please in search of the roots which constitute so large a part of their diet. Many of the larger game-birds are also in the habit of frequenting the *bejucales*. By scratching in the thick bed of rotten leaves covering the ground they obtain the worms and insects which form part of their food, while the trees with their dense overgrowth of creepers afford them good hiding-places. Some of these creepers are fruit-bearing. Of a kind of fruit about the size of a coffee-berry, and yellow in colour, which hangs in clusters from a species of *bejuco*, both *Paujís* and *Pavas* are particularly fond. *Pava* is the native name of one of the penelopes, and it is as common as the *Paují* in this region. But of all the larger birds none affects these densely wooded parts of the forest more than the *Grulla*, one of the *Psophiidæ*. There are few birds more striking in appearance than this trumpeter. It is generally met with in flocks, which at times consist of quite a large number of individuals. If a flock be disturbed while the birds are feeding close together on the ground, as is their habit, they usually make off in a body and go a considerable distance before again alighting; but if they be scattered, each individual, on being alarmed, flies up to some branch of a tree near by, where it utters its call note almost incessantly, so as not to be separated from the other members of the flock to which it belongs. A wild rush into the midst of the flock, if it be a large one, is the best way to scare and divide the birds, when they can be killed singly. In this manner it is possible to secure a good many of the birds before they unite and get away. The flesh of the *Grulla* is very tough, almost as tough as that of an old parrot; but this did not prevent the Indians from eating these birds whenever I killed any. The tinamus, of which there appears to be two or three varieties in this part of South America, are also in the habit of frequenting the *bejucales*. Although these birds are far from being rare, we obtained but few specimens. Living entirely on the ground, and at the least suspicion of danger hiding in the dense undergrowth, it is easy to understand why this bird is rarely seen. If surprised at close quarters, the tinamu rises with a loud whirr, uttering a few quick notes of alarm. At times these birds rise from almost under one's feet, and they make so much noise that one cannot help being startled. A glimpse of a large dark bird as it disappears in the dense foliage is all that the hunter gets, and before he has had time to recover from his surprise, the tinamu has vanished for ever. Although there is considerable difference in the size and markings of the members of this family, there is a great deal of similarity in their habits. Early in the morning and late in the afternoon the long-drawn plaintive notes of the tinamus can be heard. Towards sunset, on a gloomy rainy day, these birds appear to utter their call more frequently than at any other time. The flesh of all the tinamus is tender and delicate. In this respect no other South American birds can compare with them.

During our march I almost trod on a very large coral snake. The Indians begged me not to kill it. I was surprised at this, because these same men did not appear to have any scruples about destroying other snakes. Tortoises are abundant all over this region. The Indians captured several, which they tied with creepers to the branches of small trees by the side of the track they had cut, to be taken on their return. At La Prision these tortoises are kept in enclosures, and eaten on special occasions. During times of continued drought, numbers of these reptiles are caught by the men and boys who wander along the banks of the streams and pools where there is water. *Morocoy*, as the tortoise is called in Venezuela and Trinidad, is a favourite dish when well prepared. These reptiles can remain a considerable length of time without food. The liver of the tortoise is large compared with its body, and it shrinks in proportion to the length of time during which its owner has been deprived of nourishment; and this has given rise to the belief among the people that the animal eats its liver when it is unable to obtain any other food.

During this day's march we were followed by large gnats, which gave us a good deal of trouble. So persistent were they in their efforts to bite us, that there appeared to be no other means of getting rid of them, except by allowing them to alight, when they could be killed by a sharp slap. They would keep buzzing around our heads until they could settle on some bare spot, when they would nip off a bit of skin and clear out with their booty, to return a few moments afterwards with appetites whetted by the taste of so dainty a morsel. The Indians, who were clothed after the fashion of Adam before he got into trouble, suffered most from their attentions. Embarrassed with their packs, they found it difficult to keep off their tormentors, for they had more than their hands and faces to look after. On this occasion my naked companions must have been convinced that there was some advantage in being clothed. Considering that these Indians undertake journeys, often lasting for months, through dense thorny bush where wasps and ants are plentiful, it is marvellous to note how smooth and free from marks their skins are as a rule. How they can get through certain parts of the forest where the ground is actually littered with thorns has puzzled me. A man accustomed to boots who would dare to attempt such a feat would be lame before he had gone many yards. These Indians all walk with the toes slightly turned in, and they plant one foot before the other in a straight line. In cutting a track through the forest, much labour is saved if it be made narrow. But the narrower the path the more careful one has to be of the stumps and small trees on its sides. Hence the adoption by the Indians of a system of walking suited to the conditions under which they have to travel.

We ate cassava and turtle-eggs at midday, as we had done the day before. Isidor advised me to drink my fill at the stream where we then were, for we would not, he said, meet with water again until late in the afternoon. He and his companions then set the example by filling themselves up with water as only savages can do. It was necessary that we should hurry on if we meant to reach before nightfall the *rancho* built by the Indians when they cut the track. Isidor took the lead, with Sylvestre following, and they made the pace. As we proceeded the ground became uneven. The Indians told us that we were nearing the first hill, and that we would have to cross three of these hills before reaching the base of Turagua. The aspect of the country when we reached the foot of the hill was quite different to that which we had left behind us. In place of the luxuriant growth of the forest, we were going through a vegetation similar to that of the *lajas*. These *lajas* and the rocky islands of the rapids appear to be excrescences of one immense substratum of granite of which they are the highest points. Where the rock is of smooth or rounded surface no vegetation exists, but wherever there are hollows in which a bit of mould has collected there is sure to be some sort of growth, and in proportion to the depth of this layer of vegetable matter is the luxuriance of the growth which covers it. The flora of these open masses of plutonic rock is so different to that of the surrounding country, that the traveller might well believe himself to be in another region thousands of miles away from the gloom of the forest with its huge trees through which he had passed but a few minutes before. Several kinds of orchids are met with in such places. Some grow on the rocks alone, while others occur only on the moss-covered branches of the stunted trees, all knotted and gnarled peculiar to this vegetation. *Cattleya superba* and *Epidendrum Stamfordianum*, both of which are abundant in these places, attach themselves to trees and rocks. In the case of the former orchid, however, only a small number of plants are seen on the rocks, by far the greater proportion being found on the branches or trunks of trees. It is the opposite with *Epidendrum Stamfordanium*, which grows in such luxuriant profusion all over the rocks in certain parts of the *lajas* that thousands of plants might be collected in the course of a single day. A very fine *Oncidium* and a large *Catasetum* also form part of this flora, but while the *Catasetum* is fairly abundant, the *Oncidium* is rather rare. *Epidendrum elongatum* is another orchid which grows in large masses on the *lajas*, some of the masses being several square yards in extent. As this *Epidendrum* is very free in blooming, and its flowers vary in shade from light pink to the darkest scarlet, the effect produced by the brightness of colour against the sombre background of black granite is striking. I seldom saw any orchids in the forest itself, but wherever there happened to be open spots of granite or sandstone formation, orchids and flowering shrubs were plentiful.

In climbing these hills we had to proceed cautiously, as rocks of all sizes and shapes were piled loosely one on top of the other, and in certain cases we found that a slight touch was sufficient to displace masses of considerable weight, which would go rolling down the declivity to the danger of those behind. In the more open parts, patches of a tall coarse grass occurred here and there, and were a source of a good deal of inconvenience to us. The blades of this grass would cling to our faces and hands, and, if not lifted off carefully, cut us painfully when we moved away. Even our clothes suffered from the razor-like edges of this grass.

In the lower part of the valleys between the hills the vegetation again became luxuriant. We found in these hollows quantities of a fruit which in appearance and taste reminded me of the sapodilla (*Sapota achras*), but was somewhat smaller and more regular in size. The tree bearing this fruit is one of the tallest in the forest.

From the top of the second hill I obtained a good view of the cliff forming the highest point of Turagua. At the bottom of this hill we pitched our camp close to a rapid stream of beautifully clear water where the Indians had stayed when they cut the track.

March 13.—The Indians went out before daybreak, as they had done the day before, and they were again successful in bringing back a couple of curassows. Turban and Guy preferred not to attempt the ascent of the mountain, so I sent them out to collect birds and butterflies. The Indians and myself then crossed the last of the three hills which run parallel to the base of the main mass. Between this hill and Turagua there is a dark narrow gorge, at the bottom of which a rivulet trickles, forming pools along its bed. We sat on some rocks near one of these pools and rested a while, for a long stiff climb lay ahead of us. The Indians drank copiously, actually filling themselves up with water, and they advised me to do likewise, as we might not, they said, be able to obtain anything to drink until our return, so they thought it wise to absorb a supply to last for the day. There were a good many butterflies flitting up and down over the pools formed by the rivulet, while quantities of flies kept buzzing around us, settling on our hands and faces, and even getting into our eyes.

The ascent of the slope leading to the peak was at first gradual, but by degrees it became steeper. Low down in the gorge and for some distance after leaving the stream I saw but few rocks, a thick stratum of soil having formed in the bed of the valley, and this supported a vigorous vegetation similar to that we had passed through before reaching the hills. From the tops of the tallest trees came the call notes of the bell-birds. Judging by the frequency with which the metallic bang was uttered and replied to, this chatterer must be common in this secluded valley. The *Campanero*, "the bellman," as the natives call the bird, is rarely met with in the neighbourhood of cultivated spots. The presence of man appears distasteful to this lover of primeval forests, and if his domain be encroached upon by human beings, he immediately abandons it to retire to some distant recess, where he can enjoy the solitude he loves so well.

The higher we got the more rocks we met with, some of them being of considerable size. I noticed that the masses close to the cliffs were generally larger than those lower down, the blocks decreasing gradually in size in proportion to their distance from the main mass. These smaller rocks lower down in the valley had no doubt been also giants many ages ago when they lay at the foot of the cliffs which then formed the central mass of the mountain covering the spot where we now stood. The rains of ages had reduced their volume. Slowly but surely the rains of the future would continue the work of erosion, until Turagua would have wasted away to an inconspicuous hill like those we had left behind us, while those hills would have disappeared into the surrounding plain.

For a considerable distance we skirted the base of the titanic wall which forms the crest of the mountain, without being able to find any spot by which it would be possible to attempt the ascent to the plateau above. Our progress was slow, for in many places the ground was strewn with the *débris* brought down by the masses of rock in their descent from the cliffs. I sat down and rested while the Indians went ahead to try and find some place by which the peak might be scaled. In about an hour's time they returned. They had seen, they said, a gully which appeared to lead to the top of the mountain, but the ascent by it would be, they thought, difficult and dangerous. Isidor suggested that we should try the other side on the morrow, when we might find some spot offering easier means of access than the gully on this side. I determined, however, to see for myself what chances of success we should have in making the attempt by the gully. I found, on reaching the spot described by the Indians, that they had not exaggerated the difficulties of the ascent by this way. A narrow streak of vegetation, consisting mostly of ferns, marked where a stream had cut a shallow bed in the face of the cliff towering above us. For the first 200 or 300 feet our climb was up a surface almost upright, the deviation out of the perpendicular being so small that it only just allowed us to lie on our faces while holding on to the ferns and roots of the plants which the moist rock supported.

Sylvestre and Maite went first, I was third, and Isidor last. These

Indians are excellent climbers. Even the largest forest trees did not appear to offer difficulties which they could not overcome. If the trunk of the tree they wanted to climb was of such dimensions that they could not embrace it, they would choose some other tree near by, and, passing from branch to branch like monkeys, they soon got to the spot they had decided to reach.

As we proceeded we found the ascent less arduous. After the first 100 yards the gully widened out, nor was it so precipitous as lower down. Although the incline was still steep, we were able to stand up. Many stunted trees like those of the *lajas* grew from between the crevices in the rocks, but everything was greener. The rocks, trunks and branches of the trees were covered with beautiful mosses and ferns nourished by the mist which crept daily up the side of the mountain and shrouded its summit. A stately *Sobralia* grew in clumps in great profusion, while in the glades we met with the same razor-grass which had caused us so much inconvenience when we crossed the three hills. The highest point of Turagua is about 6000 feet above sea-level, and consists of one huge block of granite nearly flat on top. Stunted moss-covered trees overgrown with a scandent shrub formed the vegetation of the plateau, which also supported a dense growth of bromelias. The Indians pronounced the scandent shrub to be the water-vine (*Doliocarpus*), and as we were exceedingly thirsty they cut pieces of from 3 to 4 feet in length, which produced a small quantity of clear water. It took quite a number of these pieces to quench our thirst.

To get through the field of bromelias overgrowing the plateau, it was necessary to cut a track through them. Closely resembling the pineapple in its growth, the leaves of this bromelia are armed with sharp spikes, and the plants grow in such dense masses that they form a barrier through which it would be impossible to get without the continuous use of the hunting-knife. Even after the track had been cut we had to exercise a good deal of caution in our movements. Many of the plants bore bunches of yellow fruit, of which the Indians and myself ate a good many. The pulp is white, full of small black seeds, and, although sour, is not disagreeable. I suffered for some time after from a painful itching of the lips, tongue, and palate, and whenever I spat my saliva was streaked with blood. The Indians experienced the same sensations. The fruit of the closely allied *Bromelia pinguin* produces similar effects when eaten.

Our track led us to the south-west, and we reached a point on the edge of the cliff from which there was a magnificent view of the country to the south and west. Standing on a rock quite close to the precipice, I looked over the ocean of trees stretching away beneath us. Towards the west was the Serrania de Mato, where the Piaroas dwell, a long range of dark blue melting away in the distant haze. Through the green of the forest we could see stretches of the Caura glistening in the glare of the afternoon sun. Isidor pointed along the river to the south in the direction of the country from which he had come many years before. It would take several weeks, he said, to get to that distant village on the Merevari mountains, where his people lived. Between us and that small tribe no human habitation existed, nothing but forest, vast and impenetrable, like that which lay beneath us. We skirted the edge of the precipice for some distance with the intention of descending by some other route if practicable, but a dense mist had been creeping up the sides of the mountain, and we were soon enveloped in it, rendering any further exploration along the cliff impossible. It rained heavily, and we got drenched to the skin. The rain was accompanied by violent gusts of wind, which at this altitude, with our soaked clothes clinging to our bodies, made us feel somewhat chilled. As soon as the fog had cleared up, we retraced our steps through the field of bromelias to the spot where the descent began. We sat on some rocks and ate roasted *paují* and cassava, which the Indians had brought tied up in wild banana leaves. The descent did not take much time, but as we had left the mountain late it was almost dark when we got within sight of our camp, which we could make out at some distance below us by the bright fire kindled by Turban and Guy. We shouted to give notice of our approach, and, hurrying on, we were soon seated within the circle of ruddy light which the burning logs cast around. Turban said that he had been out the greater part of the day, and had returned a couple of hours before us. Both he and Guy were of opinion that it would be impossible for us to remain where our camp was pitched, if we intended to stay in the neighbourhood of the mountain for a few days. On their return from hunting they had found the whole place alive with flies. Never, they said, had they seen so many flies together. The blankets spread out to dry, our clothes and hammocks, a couple of curassows tied to a branch, everything almost which had been left exposed, had been used by these flies for depositing their disgusting larvæ. From the moment of their arrival they had been occupied passing our things over the fire so as to rid them of the filth left by these disagreeable visitors.

Raoul had shot three curassows. We dined off these and roasted ripe bananas, and then retired to our damp hammocks. Although I was very tired I passed a bad night, as the quantity of bush ticks I had collected on my body during our day's tramp kept me awake the greater part of the time.

March 14.—At daybreak we had the usual cup of black coffee, which becomes indispensable after a time. With Maite's assistance I managed to get rid of some of the ticks with which I was covered, and I then had a good long bath so as to allay the irritation caused by the *garrapatas*, as ticks are called by the natives. With sunrise the flies began to arrive, and by eight o'clock they were numerous enough to be disagreeable. By the time we had finished breakfast half an hour later they were around us in swarms; it was time to think of getting away. The Indians made up their packs as hastily as they could, and we left without regret this paradise of flies. Although my naked companions were much more heavily laden than Turban, Guy, or myself, we found it difficult to keep up with them until we reached the stream which we had passed two days before. There they left us and hurried on ahead, and we did not see them again until we reached our camp late in the afternoon. It never occurred to them, considering that their track was in places difficult to follow, that we might go astray and get lost in the forest. Probably they expected us to possess some of that instinct for following a trail with which they were so highly gifted. On the way we surprised a flock of trumpeters, and shot three. In addition I killed two penelopes. When we were quite near to our camp it rained heavily, and although we hurried on as fast as we could, we were wet to the skin by the time we reached shelter. The Indians had not forgotten the tortoises left on the way; they were now hanging from the rafters of our *rancho*.

March 15.—We breakfasted early. The Indians broke the shells of the tortoises with a heavy log of wood. They then picked the pieces of shell off the still quivering mass of flesh, which they wrapped up in banana leaves. After crossing the stream they hurried on as they had done the day before, and when we got to La Prision in the afternoon, I found that they had gone on to Isidor's house, probably to have a night of it, leaving word that they would return in the morning. We proceeded with caution, for had we strayed from the trail we might have got lost in the depths of this interminable forest. Game birds were plentiful; but I decided on not wasting time in following them up, as it would have been too fatiguing to have to carry a number of heavy birds over the distance we still had before us. Perhaps the Indians had left us to avoid having to add to their burdens. I killed only four trumpeters as specimens.

By one o'clock we reached the *Laja Grande*, and shortly afterwards we passed before a large *rancho* occupied by several people. Two of the men were breaking tonca beans on a slab of rock, while one of the women was mending clothes and another was cooking. They asked us to stay and share their meal. Although we were all very hungry, I thought it best to refuse their invitation; I knew that if we once sat down we should feel more fagged when we should have to resume our tramp. We passed another hut about a mile further on, and reached La Prision late in the day. For a couple of days we were all footsore, and spent most of the time in our hammocks.

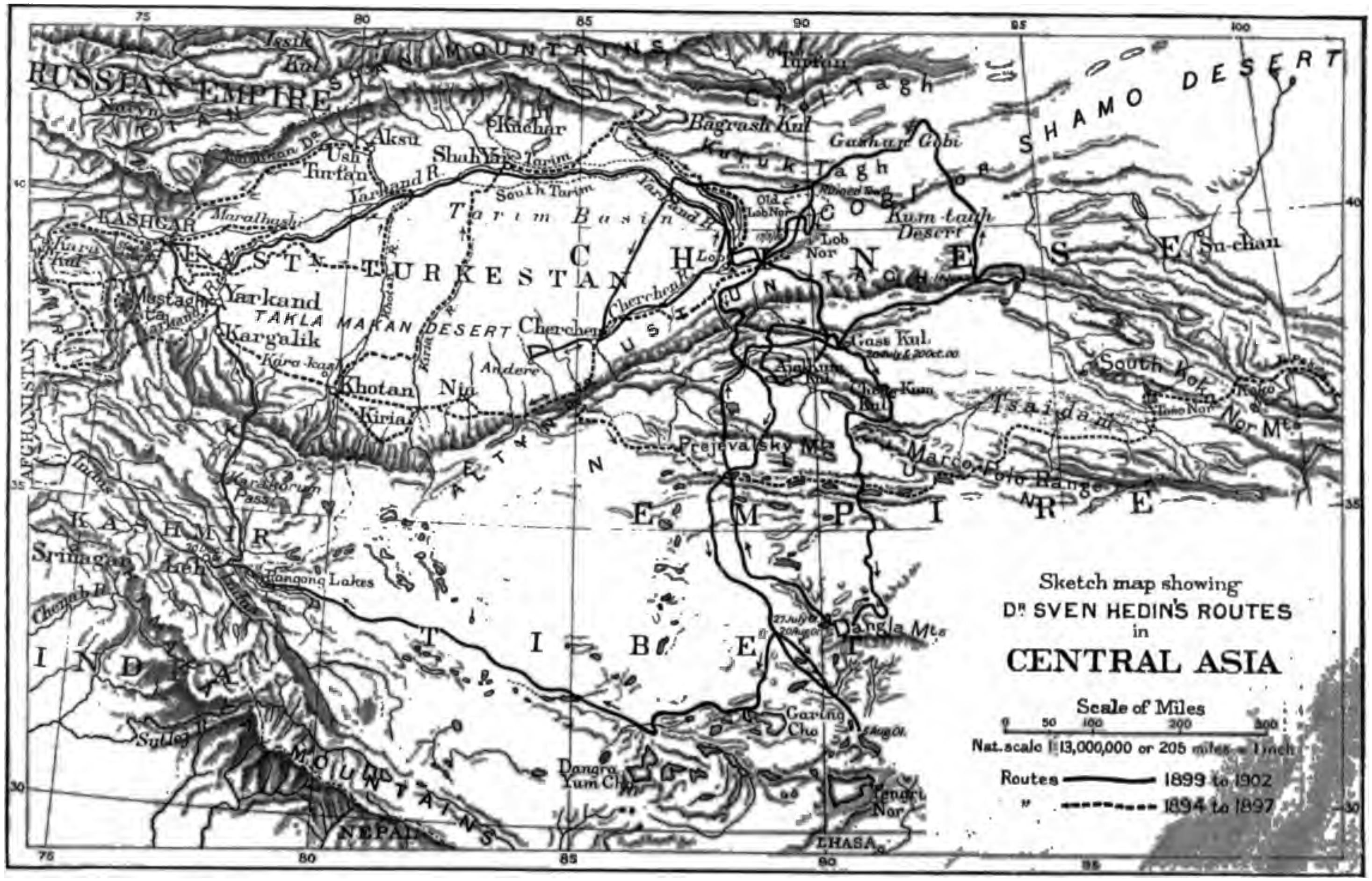
SUMMARY OF THE RESULTS OF DR. SVEN HEDIN'S LATEST JOURNEY IN CENTRAL ASIA (1899-1902).

By Dr. SVEN HEDIN.

THE geographical regions which were the principal objects of exploration during my journey in Central Asia in 1899–1902 are indicated on the accompanying map. It will be seen that I endeavoured to avoid travelling over again routes where other explorers had been before me.

1. *The River Tarim from the Environs of Yarkand to its Lower Extremity.*—This river has been mapped on about one hundred sheets, on the scale of 1 : 35,000, large enough to display all the characteristics and changing features of the stream. The alluvial deposits, which have been laid down in the bed of the river since the current dwindled, as well as every accumulation of mud and every sandbank, have all been indicated. So also have every angle and curve of the bed which the stream has now abandoned; and wherever it has been possible to do so, I have noted the *time* at which these desertions took place. I have ascertained that throughout the whole of its course the stream shows a tendency to shift its bed to the right, that is, to the south. It is especially on that side, namely, the right, that the main stream sheds off its numerous arms or secondary channels, and it is a very common occurrence for the river to follow, for longer or shorter distances, first one and then another of these auxiliary arms. The tendency increases in frequency the nearer the river approaches its terminus, and is most extensively developed immediately before the terminus, where, instead of emptying into the ancient lake of Lop-nor, it now goes on past it and forms the lake of Kara-Koshun, farther to the south.

Throughout the journey I was accompanied by native hunters and shepherds; but as soon as each man's local knowledge came to an end he was dismissed and another guide engaged in his place. Every name given to the stream was recorded, every channel mapped, and the diverse characteristics of the country adjacent to the banks, the graves of saints, the towns, the shepherds' camps, the fords that connect the highways on each side of the river, the lagoons and lateral lakes, the boundaries of the sand-deserts, and so forth—all were noted and plotted out on the sheets of the map. In this way I gathered a mass of material for a minutely detailed monograph upon the course of the Tarim, and the conditions which characterize this the greatest river in Central Asia. In fact, the map is so detailed that with its help it would be possible to construct a profile of the river-bed, at all events to form a clear conception of its structural formation. A number of astronomical positions were determined for the purpose of fixing and controlling the longitude and latitude. Every day, or at least every


Sketch map showing
Dr SVEN HEDIN'S ROUTES
in
CENTRAL ASIA
Scale of Miles
0 50 100 200 300
Nat. scale 1:13,000,000 or 205 miles = 1 inch
Routes 1899 to 1902
" 1894 to 1897
RUSSIAN EMPIRE
SHAMO DESERT
CHINESE EMPIRE
EAST TURKESTAN
TAKLA MAKAN DESERT
Tarim Basin
TIBET
KASHMIR
INDIA
NEPAL
AFGHANISTAN
Kashgar
Yarkand
Kargalik
Khotan
Kiria
Nia
Andere
Cherchen
Aksu
Ush Turfan
Kuchar
Shah Yar
Turfan
Bagrash Kul
Gashun Gobi
Kuruk Tagh
Lob Nor
Old Lob Nor
Kum-tagh Desert
Gass Kul
Su-chau
South Koko Nor Mts
Tsaidam
Prejevalsky Mts
Marco Polo Range
Dangla Mts
Garing Cho
Dangra Yum Cho
Tengri Nor
LHASA
Leh
Srinagar
Pangong Lakes
Karakorum Pass
Mustagh Ata
Sutlej
Indus
Chenab R.
Yarkand R.
South Tarim
Tarim
Cherchen R.
Khotan R.
Kiria R.
Kara-kash
Maralbashi
Issik Kul
75
80
85
90
95
100
40
35
30

second day, the volume of the stream was measured; it was found to vary very considerably during the course of the journey. This, however, is neither the place nor the time to dwell upon the causes of this changeability in the levels of the river. Indeed, throughout the whole of its course the conditions of the Tarim are more complicated than would be presupposed, and not a year passes without the channel undergoing very considerable changes.

A large number of photographs were taken all through the journey; meteorological observations were recorded three times every day; and the self-registering instruments used for this purpose were employed throughout the whole of the day.

2. *The Desert between the Lower Tarim and the Cherchen-daria.*—This part of the desert of Gobi, which had never been visited before, was crossed from Karaul to Tatran (north of Cherchen), and proved to possess an entirely different conformation from the desert of Takla-Makan. The sand, which is heaped up in dunes that go to over 300 feet in altitude, is not continuous, but is interrupted by tracts of perfectly level soil entirely destitute of sand. In the southern parts of the desert small patches of tamarisk and *kamish* (reeds) were met with occasionally, and in such localities water can be obtained by digging down to 6 or 7 feet in depth.

CAMP IN TIBET.

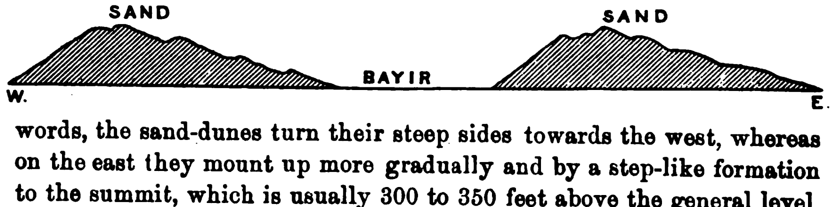
3. *The Region between Cherchen and Andereh.*—This consists of a narrow strip of *tograk* (poplar) forest and steppe, lying between two sand-deserts on the way from Cherchen to Keriya. The more southerly

of these deserts is of no great extent. The region itself is watered by certain of the streams which flow out of the Kwen-lun mountains.

4. *The Lower Course of the Cherchen-daria.*—The regions on both sides of this river were explored, and it was ascertained that the Cherchen-daria also shifts and changes its bed.

5. *The Lower Course of the Tarim between Yanghi-kull and Kara-koshun.*—This part of the course of the Tarim is the most intricate and the most difficult to disentangle of any section of the entire system; accordingly I devoted several independent excursions to its exploration. For example, I was at work there in February, 1900, in the end of April, and the beginning of May, 1900, and again in June of the same year, and each time I adopted a new route and travelled along different branches of the river, all of which were mapped. The contours here are so flat that the stream is subject to the greatest changes, and the current is continually seeking out new channels. At my last visit the little settlements, which have grown up on the banks of the river since the Chinese created the Lop region a separate administrative district, were in danger of being deserted by the stream, and the inhabitants were considering the advisability of building dams to retain the water. How far they will be successful in this the future will determine, but probability is against them.

The tendency of the Tarim to form lateral or marginal lakes begins as high up as Yanghi-kull, where I had my headquarters from December, 1899, to May, 1900, as well as an observation station, at which my self-registering instruments were uninterruptedly at work. Between Yanghi-kull and Arghan the right bank of the river is accompanied by a chain of long lakes bordered by sterile sands, with sand-dunes as much as 300 feet or more in height. The lakes are elongated, and stretch from north-north-east to south-south-west, and are in every instance continued by a series of depressions, penetrating into the heart of the thick masses of sand. These depressions, which the natives call *bayir*, consist of a clay soil without a particle of intermingled sand, and except for a few sparse patches of *kamish* and tamarisks close beside the Cherchen-daria, are absolutely barren. The discussion as to the origin and construction of these depressions must be reserved for another occasion. An east-west vertical section cut through the heart of the Cherchen-Desert would reveal a serrated profile something like the subjoined diagram. In other words, the sand-dunes turn their steep sides towards the west, whereas on the east they mount up more gradually and by a step-like formation to the summit, which is usually 300 to 350 feet above the general level. This arrangement can only be due to one cause—winds from the east.



The greater part of the lakes which thus accompany the right bank of the Tarim were mapped and sounded during the summer of 1900.

It is impossible here to enter into fuller details with regard to the labyrinth of lakes, marshes, and collateral river arms which constitute the changeable delta of the Tarim. In fact, it would be labour in vain to attempt to do so without a general map, and a general map can only be constructed when the cartographical material which I have brought home has been digested, a task that will require at least three years for its completion.

BOGTSANG-TSANGPO.

The lakes which I mapped on the occasion of my first journey—Avullu-kull, Kara-kull, etc.—still remain of the same dimensions and keep the same positions; but a number of fresh lakes have been formed in the same region. In fact, the lower Tarim seems disposed to change its course entirely.

6. *The Position of Lop-nor.*—This interesting problem is now solved. The ancient historical Lop-nor is situated precisely where Baron von Richthofen considered that it had been discovered; but its basin is of course now dried up. On its northern shore I found ruins of towns, settlements, and temples, as well as a number of manuscripts, letters of local origin, and tablets of tamarisk wood written on with Chinese script, and dating from 264 to 465 A.D. Further, I discovered on the same northern shore of the ancient lake unmistakable indications of a great caravan route. With the view of ascertaining definitively and thoroughly the contours of the region, I made in the spring of 1901 precise levellings throughout the whole of the lake basin, and the result showed conclusively that the former Lop-nor and the present

Kara-Koshun lie practically at the same level, and are only separated from one another by an insignificant swelling of the ground. Kara-Koshun, however, shows a decided tendency to return to its former situation—a large lake which took me four days to travel round having been formed to the north of it. This new lake is fed by several new streams issuing out of Kara-Koshun, and carrying a volume of not less then 1060 cubic feet in the second.

7. *The Mountain Chain of Astyn-tagh from the Meridian of Charklik to Anambar-ula.*—This mountain chain was crossed and explored in several different places during the course of the year 1901, and the result of my investigations shows that the chain is a double one, not, as shown on our maps, single.

8. *The Desert of Gobi, west of Sa-chau.*—This was journeyed across from the south to the north in January, 1901. It consists of the following belts or sections: accumulated drift-sand, clay terraces, carved by the wind, and *kamish* steppe. Then follow the low hill ranges which form the eastward continuation of Kurruk-tagh; there again we discovered traces of ancient caravan roads.

9. *Eastern, Central, and Western Tibet.*—This mountainous region of Central Asia was the particular object of my interest during this my last journey, in that I had made up my mind to explore as much of it as I possibly could. To this end I made several separate excursions into Tibet. Profiting from the experience learned in my former journey through the same region, I deemed it expedient to travel with a smaller

LANDSCAPE IN WESTERN TIBET.

caravan of perfectly fresh animals, and as small a quantity of baggage as might be, and so planned my expeditions that I was always able to go back to my base or principal camp, where the various members of my caravan, human and animal, were, from time to time, able to rest and recruit themselves. In this way I was always able to start with a fresh caravan, thoroughly rested and vigorous. My first expedition was made in the months of July, August, September, and October, 1900. Starting from Mandarlik, beside Gas-nor, I travelled due south as far as 33° 45′ N. lat., thence west, north-west, north, and north-east, until I came back to my starting-point. A large part of the caravan, including one man, perished under the incredible hardships which are incidental to journeying in these lofty regions, destitute as they are of every species of vegetation. On both the out journey and the return, I had an opportunity to cross over the various mountain chains encountered, and clear up the orographical structure of the Kwen-lun and the complicated mountain system of Northern Tibet. The positions of a large number of salt, as well as freshwater, lakes, were determined, and their waters navigated by boat. At the same time I took a number of interesting soundings, the greatest depth measured being 157½ feet. The topographical results of this excursion were embodied in a map of 150 sheets.

My second expedition started from the same base. Its object was to complete the mapping of Northern Tibet, especially of the mountains to the north of Kum-kull. This lake also was sounded. These Tibetan lakes are dangerous to navigate in a small open sailing-boat; to do so is always attended with a considerable amount of peril.

But my principal and longest journey through Tibet began at Charklik on May 17, 1901. The route I selected went first up the valley of the Charklik-su, then on to Kum-kull, and over the Arka-tagh. After that I struck a line between the route followed by Littledale and that followed by Prince Henri of Orleans and Bonvalot, and penetrated southwards as far as 33° 45′ S. lat. There the caravan encamped, whilst, accompanied by two attendants, and in disguise, I made a perilous journey as far as the vicinity of Tengri-nor. There we were closely examined, and compelled to return to the caravan, though the Dalai-Lama's emissaries treated us with the greatest respect and politeness. A second attempt to penetrate south from the same camping-place was frustrated at Sellisy-tso by a force of five hundred horsemen.

After that I directed my course westwards to Leh, avoiding both Nain Singh's and Littledale's routes. This journey cost me the lives of two men and of almost all my animals. The baggage animals were yaks, which were everywhere placed at my service by command of the Dalai-Lama. The results of this last journey in Tibet are recorded on a map of 370 sheets.

Whilst the survivors of my caravan were resting at Leh during the winter of 1901–2, I took a run down into India, and shall ever retain a lively recollection of the hospitality and kindness which were shown me by Lord Curzon at Government House. In Bombay, also, I was welcomed as if I had been an old friend by Lord Northcote, and in every city I visited in India the English people vied with one another in their friendly offices towards me. Nor can I withhold the expression of my admiration at the brilliant way in which England has for more than a century administered that vast empire.

In April I broke up from Leh, and, crossing the Karakorum pass, went down to Yarkand; thence, travelling *viâ* Kashgar and the Caspian sea, I returned to Stockholm, where I arrived on June 27, 1902.

The successful issue of this journey, which lasted altogether three years and three days, was in great part owing to the circumstance that his Majesty the Emperor of Russia most graciously appointed an escort of four cossacks to attend upon me throughout. Than these I have never had more honest, more capable, or braver men in my service. Whilst I was absent on my excursions I always left my headquarters camp under the charge of one or two of them, and always had my confidence justified by finding everything in perfect order on my return.

YARKHLEK-SUS PASS.

My first journey of 1893–97 has been regarded as marking an advance in the knowledge of the geography of Central Asia. The last journey of 1899–1902, from which I have just returned, has yielded results three times as rich as those of the former journey, and in the course of it I have been enabled to lift the veil which for a thousand years had hidden vast stretches of the mountainous and desert regions of the heart of Asia.

My cartographical material extends to no less than 1149 sheets, and if these were arranged end to end in a long row they would stretch over a distance of 1000 feet. This material I hope it will be possible to publish, either with the help of public funds or by private support. It will then constitute a mine of detailed information about certain of the central regions of the great continent which have never before been trodden by any European, and very often by no Asiatic either. This cartographical material is controlled by 114 astronomical determinations of place. For making these I used an alt-azimuth theodolite and three chronometers.

A complete meteorological journal was kept without interruption throughout, in part during my expeditions, in part also, and simultaneously, in my principal fixed camps, where a barograph and a thermograph were in constant operation. The abundant materials thus gathered in are now being worked up by Dr. Nils Ekholm, and will in due time be published, along with the meteorological results of my first journey.

I took also over two thousand photographs, using for this purpose an English camera and English-made plates, and the results leave nothing to be desired.

Anatomical collections of the higher animals were made, including aquatic animals in spirits, and a herbarium was brought together. All these materials will be studied by experts.

The geological profiles of Tibet will be illustrated by some seven hundred rock specimens collected in that region.

I have also brought home a number of archæological treasures from the ruins we discovered in the desert, amongst them several objects of extraordinary interest; and I made, further, a great quantity of sketches, diagrams, and drawings, to illustrate various features appertaining to the provinces of physical geography. In a short *résumé* such as this, it would not be possible even to indicate the great variety of different observations which are embraced under this heading. It must suffice to mention the measurements made in the basin of the Tarim, upon which a vast amount of time was expended, but which supply the essentials for deducing the hydrographic character of that river system.

For the present I have my hands full with the preparation of a popular description of my journey, which will be most copiously illustrated. The scientific results will be published later on in a work especially intended for scientific students.*

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* About the high value of the cartographical and other material brought home by Dr. Sven Heden there can be no doubt. It is to be hoped that either through private enterprise or by the liberality of the Swedish Government it will be made available in full detail.—Ed. *G. J.*

THE INTERNATIONAL COUNCIL FOR THE STUDY OF THE SEA.

The International Council for the Study of the Sea was constituted at Copenhagen on July 22, when delegates of the governments of the United Kingdom, Germany, Holland, Denmark, Norway, Sweden, Russia, and Finland met and drew up the constitution of the new body. Belgian co-operation is also expected, leaving France as the only maritime power of Western Europe which is not represented. As at the preliminary conference at Christiania last year, the British delegates were Sir Colin Scott Moncrieff and Prof. D'Arcy Thompson, accompanied by Dr. H. R. Mill and Mr. W. Garstang as expert advisers. The German delegates were Dr. Herwig, President of the German Sea Fisheries Association, and Prof. O. Krümmel of Kiel; Dr. P. P. C. Hoek represented Holland, Captain Drechsel and Dr. Knudsen with Dr. Petersen represented Denmark; Dr. Nansen and Dr. Hjort came from Norway; Prof. O. Pettersson and Dr. Tryhom from Sweden; Dr. Knipovich from Russia; and Prof. Homén and Dr. Nordqvist from Finland. The Danish Government acted as hosts, and welcomed the Council to Copenhagen, the leading part being taken by the Foreign Minister (who is also Prime Minister), M. Deuntzer. The King of Denmark received the representatives in the Amalienborg Palace, and expressed his personal interest in the work now commenced.

The work of the Council was carried on by two committees meeting simultaneously and reporting to the full meeting of the Council, which, after discussion, adopted their reports. As far as regards the oceanographical work, the recommendations of the Christiania Conference, which were fully described in the *Geographical Journal* for July, 1901 (vol. xviii. p. 77), were adopted, with a few slight variations shown by experience to be necessary. The principle of simultaneous observations four times a year as the basis of a system of regular observations of temperature, density, and plankton was confirmed, and the share to be taken in the work by each of the participating nations was practically settled. The two ships which the British Government has voted for the work will undertake periodical trips in the Færoe-Shetland channel and across the northern end of the North sea, working from a central harbour in Shetland, and also simultaneous trips in the western part of the English channel. It was found impracticable without a third vessel to undertake observations off the west of Ireland and Scotland, although the importance of studying the Atlantic was fully appreciated by the Council. The southern half of the North sea will be investigated by the Dutch, the northern half by the German ships. Denmark undertakes the sea between Færoe and Iceland, while Norway has the heavy task of making observations in the North Atlantic off the extensive western seaboard of Scandinavia. Russia has undertaken similar work along the Murman coast and across Barents sea to Novaya Zemlya, while the Baltic will be studied in detail by Danish, Swedish, Finnish, Russian, and German ships.

While the periodical oceanographical trips are the framework of the whole system of observations, they are intended to be connected and completed by observations at fixed stations, such as light-ships and by the co-operation, as far as surface observations are concerned, of regular lines of steamers crossing the North sea and the Atlantic. The observations will be published by the Central Bureau of the Council as soon as possible after the termination of each quarterly cruise.

The biological work of the Council has been limited, by the conditions which most of the Governments concerned have attached to their grants, to the investigation of special problems of urgent practical importance to fisheries, from the study of which results may be expected within the short term of years for which the grants have been voted in the first instance. Two such problems were selected, and a special committee was appointed to direct the international work on each, each committee being under the charge of a *Geschäftsführer*, a functionary for whom the only possible English title is "convener," a convenient term familiarly used in Scotland, though scarcely known south of the Tweed. One committee has been charged with the duty of investigating the migrations of such fish as the cod and herring, with Dr. Johan Hjort, who has already done brilliant work on the subject as convener. The other is charged with the investigation of the whole question of over-fishing in the parts of the North sea most frequented by trawlers, and of this Mr. W. Garstang of the Marine Biological Station, Plymouth, will be convener. The latter is of special importance to British fisheries, as it deals with the possibility of the resources of the sea becoming exhausted by continuous fishing, and its report may possibly afford a basis for international action in protecting threatened areas. On both committees there are two British representatives, one for England and one for Scotland, and one representative of each of the other countries concerned.

The organization of the Central Bureau of the Council was also determined. Its personnel consists of Dr. Herwig as president, Prof. Pettersson as vice-president, Captain Drechsel as honorary treasurer, and Dr. P. P. C. Hoek as secretary. The seat of the Bureau is in Copenhagen, and the chief assistant will be Dr. Knudson, lecturer on physics in the Polytechnic school there. All the publications of the Council will be issued by the Bureau, which will also form the medium of communication between the various national organizations, the special committees, and others.

The international laboratory has been established in Christiania, with Dr. Nansen as honorary director and Dr. Walfrid Ekman as assistant for physical work; an assistant for chemical work is also about to be appointed. The laboratory will undertake the training of observers for the various national organizations, the testing of instruments, the supply of standard sea-water for controlling salinity determinations, and also gas-analysis. It will also carry out experiments with improved apparatus and methods in order to ensure a degree of accuracy never before aimed at in work at sea. It was recommended that the laboratory should, if possible, be opened in October, and that the periodical cruises be commenced as soon as possible, but at the latest by the spring of 1903.

An important experiment has thus been set on foot, which promises results of great interest and value if all concerned in kindred researches will co-operate heartily to make the work a success. The suggestion has been made in this country that the advantage of international co-operation will be greater to continental nations than to us; the fact is absolutely certain that the advantage will be granted to the nation that is best prepared to apply practically the scientific facts which may be obtained.

THE "SUDD" OF THE WHITE NILE.

By EDWARD S. CRISPIN, M.R.C.S., L.R.C.P.

EVER since Major Peake's sudd-cutting expedition it has been possible for steamers to go through from Khartum to Gondokoro (Uganda) by way of Lake No and the Bahr-el-Ghebel, and there is now a monthly mail service running that way; but at a place on the Bahr-el-Ghebel called Hellet-Nuer the steamer leaves the true river-channel, and for a distance of about 25 miles passes though a series of lakes in which the depth of water is only 4 or 5 feet. This channel, although up to date it has answered perfectly, was considered somewhat precarious, and the object of the Sudd Expedition 1901-1902 was to try and open the true river-bed.

The method here explained, with the aid of photographs taken, was that employed by Major Matthews, who commanded the expedition.

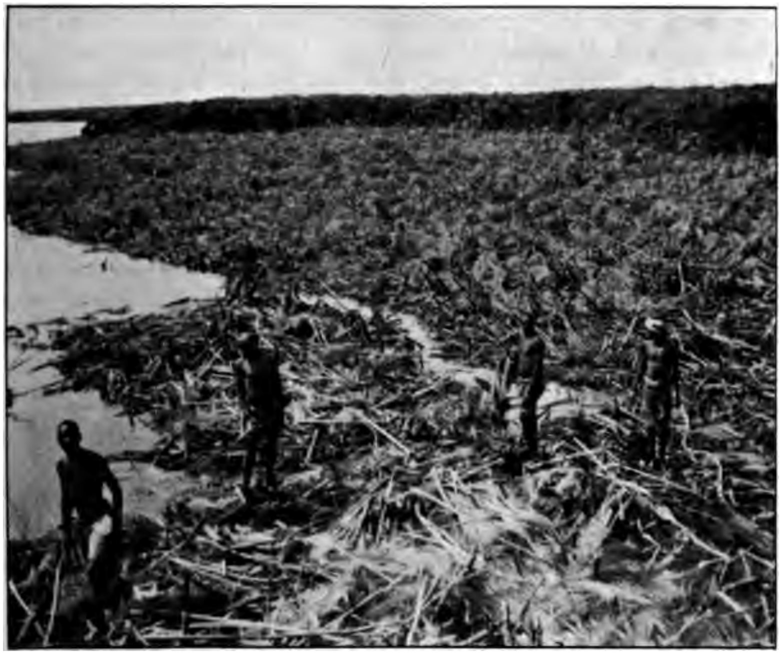
The first difficulty, when you are encountered by an endless barrier of sudd, is to discover where, in this sudd, the river-bed runs. This is done by a method of probing through the sudd; the average depth of water in the sudd is only a few feet, but when the true river-bed is reached this suddenly increases to a depth of 15 to 18 or 20 feet. Having found the river-bed, the first thing to do is to cut down or burn the top growth on the sudd, consisting mostly of papyrus. A curious and unexplained fact noted by Major Matthews was, that when the papyrus was fired the fire frequently spread along what was afterwards discovered to be the true bed of the river.

CAMP ON PIECE OF TRUE RIVER-BANK IN THE SUDD.

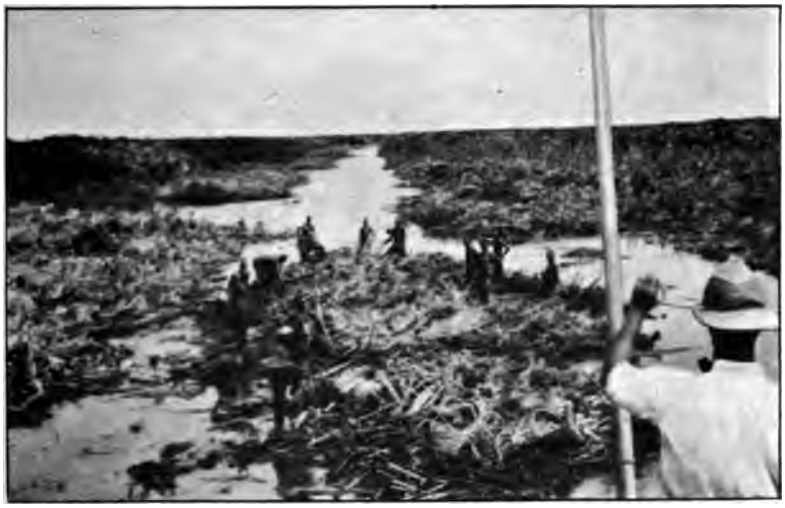
GENERAL VIEW OF NEWLY OPENED CHANNEL THROUGH SUDD, WITH SMALL SUDD ACROSS IT.

MEN LANDING FROM THE BOWS OF THE STEAMER ON TO A SUDD BLOCK WITH ITS TOP GROWTH OF PAPYRUS.

MEN ON SUDD BLOCK CLEARING THE TOP GROWTH.



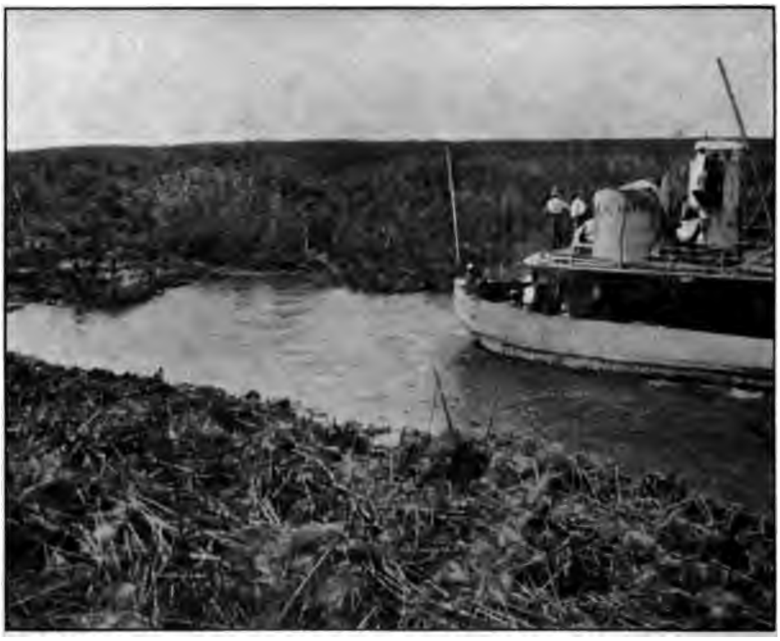
TOP GROWTH CUT DOWN AND BLOCK CUT INTO SECTIONS.



STEAMER TOWING OUT BLOCK OF SUDD: MEN STANDING ROUND AND HOLDING THE HAWSER IN POSITION.

Having cleared the top of the sudd block, the men are landed with large saws to cut along the true river-bank, which may be either submerged with a few feet of water over it and papyrus and sudd on it, or solid ground with ant heaps, the solid ground never being of any great extent and always surrounded by swamp. Cross and parallel cuts are then made through the sudd, dividing it into blocks of a convenient size for the steamer to tear out; the size of these blocks, of course, depending on the consistency of the sudd and the power of the steamer.

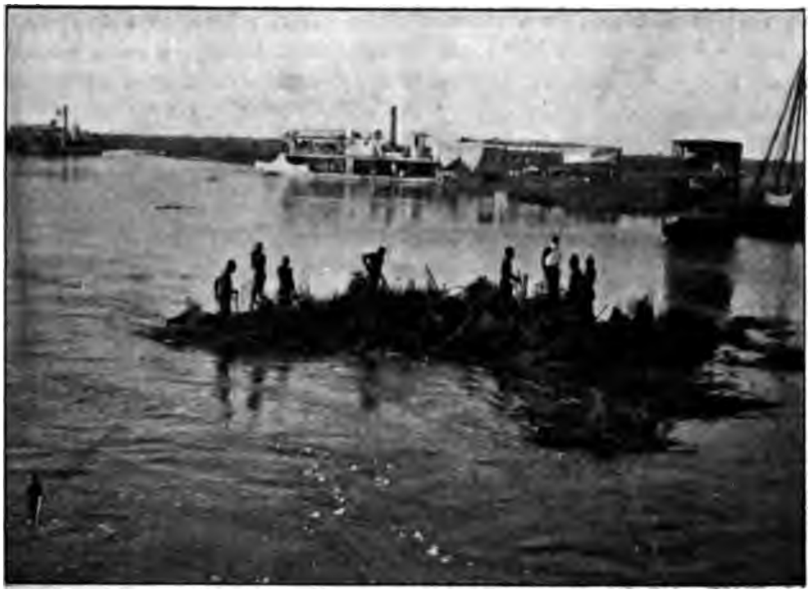
Having cut the sudd into convenient blocks, the bows of the steamer are run into the block; the loop of a steel hawser, both ends of which are made fast to the steamer, is passed over the bows of the steamer, where it is taken by the men on the block, and placed in the trench cut and trodden down with their feet. The steamer then goes full speed astern, the men all standing on the hawser to keep it in position. In the case of tough sudd, as many as twenty trials may have to be made in this way before the block of sudd eventually tears away.



STEAMER TOWING OUT SUDD BLOCK.

In the case of shallow light sudd, the hawser may be trodden down too deep and slip underneath, in which case the block will be cut free, but have to be towed out afresh.

When the block is torn out, the steamer goes slowly astern till it is towed clear into the current—if there is one—when it is cast adrift to



BLOCK TOWED OUT INTO OPEN WATER, MUCH DIMINISHED IN SIZE DURING ITS JOURNEY PARTLY BY COMPRESSION AND PARTLY BY THE FRONT EDGE ROLLING UNDER.

BLOCK LET GO IN OPEN WATER, FLOATING DOWN STREAM.

float down stream, where it is gradually disintegrated; if there is no current, it is towed to a piece of open water, where, as a temporary measure, it can be tied by ropes to the bank, leaving a wide enough channel for the steamer, and on the appearance of a current be cut adrift to float down stream.

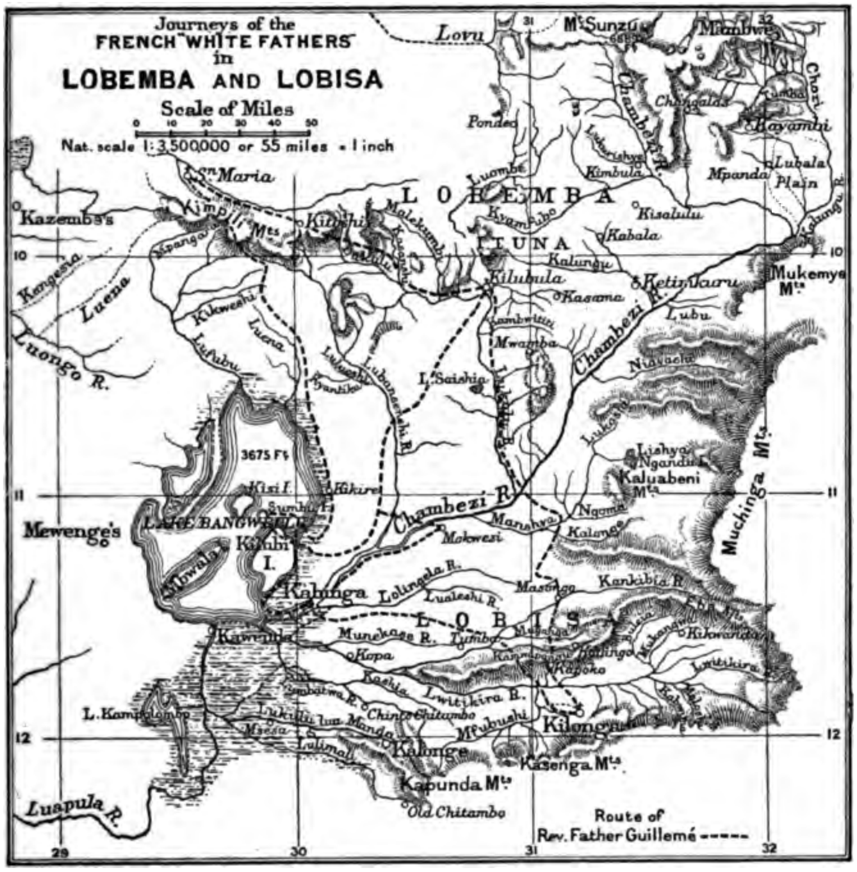
The chief growths in the sudd are papyrus and tiger or elephant grass, a kind of bamboo growing to a great height, 20 feet or more. Up these climbs a creeper of a kind of convolvulus. Besides these there is abundance of ambatch and a long sword-grass that cuts like a knife, known as "oom soof." The steamer could cut its own way through this latter, which, in the presence of a current, would be broken up and float down stream, offering no obstruction. In its absence, however, it does not float away, but obstructs the steamer by constantly fouling the paddle-wheel. There was another very light kind of duckweed which covered some of the small open pools, and, in the absence of a current, was a great nuisance for the same reason.

GEOGRAPHICAL RESULTS OF THE EXPLORATIONS OF THE FRENCH "WHITE FATHERS" IN NORTH-EASTERN RHODESIA.

By HENRI MAITRE.

It was in 1895 that the "White Fathers" undertook their first expeditions to Lobemba. After the death of Mwamba, the paramount chief, the country was, in 1898, opened to Europeans, and Bishop Dupont, who had carried through the negotiations to this end with much skill and courage, established himself at Kibubula, at a little distance from the old capital of Mwamba. It is from this centre that the missionaries have since carried out their extensive journeys of exploration. In Lobisa, on the last spurs of the Muchinga range, a post was founded at Kilonga, almost at the source of the Pandafishiala, a subordinate feeder of the Lwitikira; while north of Lake Bangweulu, in the upper basin of the Liposochi, the station of "Notre Dame de Mweru" has been founded, and more recently still, on the middle course of the Chambezi, that of "Notre Dame de Bon Conseil." The whole of the districts of Lobemba and Lobisa have thus been traversed during numerous journeys, and the whole southern basin of the Chambezi and of Lake Bangweulu has been visited. Father Guillemé has navigated the lake, and the almost unknown region of the Luena and the Liposochi has been explored. The routes of the French missionaries form a veritable network over the whole country, and it is now possible to give an exact description of districts which but yesterday were all but unknown.

The whole of Lobemba is watered by the Chambezi, which, as is well known, rises in the western section of the Nyasa-Tanganyika plateau. Flowing first south-east in a clear and rapid stream, it receives a large number of brooks and torrents, and is soon swelled by the junction, on the right bank, of the Lukurishye and the Kyamfubo, the former an important affluent coming from the outer margin of the Ulungu highlands. The Chambezi becomes then an important stream, 80 yards wide and 10 to 13 feet deep, and flows at a rapid rate between banks bordered with gigantic trees, behind which stretches the plain dotted over with stunted shrubs and brushwood. Soon, however, the aspect of the country changes, the banks being composed in turn of granite and sand, but almost everywhere covered with dense vegetation. The river presents a wild and imposing appearance, not a living being disturbing the quietude of its waters, into which many torrents precipitate themselves down its steep banks. In 10° S. it receives on the left a large tributary—the Kalungu—which rises in the western part of the Nyasa-Tanganyika plateau, and, swelled by the Chozi, carries a large volume of water into the Chambezi. The latter, now a large river, takes a south-westerly direction on meeting the Mukemye mountains and the imposing mass of the Kilinda range, receiving on the right bank the Kalungu, which flows past the old capital of Ketimkuru, formerly ruler of the Lobemba country.



Soon after this the country becomes flat and marshy, the Chambezi flowing through the Central African "puri," which hardly changes its character until Bangweulu is reached. After receiving the Niuvushi from the southernmost outliers of the Kilinda range, the Chambezi turns south, spreading out into a vast marsh, beneath the waters of which its banks disappear. The surface is broken by clumps of reeds and thousands of conical anthills, mostly covered with twisted and stunted trees. During the dry season the width of this permanent inundation is about 12 miles, but it is much greater still during the rains. During the summer there is not always even a narrow strip of land between the swamps and the river, which is itself a mile or more wide. It consists of several arms bordered by huge papyrus, the principal channels—three or four in number—being some 20 yards in width, and about 25 feet deep.

Further on the ground becomes gradually drier, and the river re-enters the "puri," still dotted over with anthills, but inundated only during the rains. In this central part of its course the Chambezi is narrower, the average width being about 30 to 35 yards, and the current tranquil. The right bank is wooded, and high. In this section its course is broken by a rapid, passable by boats only at high water, below which it receives the Lukulu coming from the western portion of the Kimpili mountains, which form the divide between Mweru and Bangweulu. The Lukulu, which flows generally south and south-east, is joined by many other streams—among them the Luombe, on the hilly banks of which the mission station of Kibubula is situated.

A little below the confluence of the Lukulu, the Chambezi is joined on the left by the important river Manshya, which, after issuing from the swampy lake Lishya Ngandu, 5 miles long, descends from the outer zone of the Muchinga uplands, and is afterwards deflected west by the Kaluabeni mountains. Its bed is encumbered by rocks and boulders. The last large tributary of the Chambezi on the right bank is the Lubansenshi, which comes from the Kimpili mountains, and in its upper course traverses a level country with a few isolated hills and some forest. Its lower course is parallel with that of the Lukulu. It is at the confluence of the Lubansenshi that the Chambezi estuary begins. It is roughly crescent-shaped, its axis running from north-east to south-west, and measuring some 25 miles in length, with a mean width of 1½, and a depth of some 16 feet. Its bed is strewn with islands, on one of which, in the central part of the estuary, is the village of the chief Kabinga. The river is here 2 miles wide and 20 feet deep. Almost opposite Kabinga, on the right bank, is the mouth of the Luangenge, a swampy stream with a short course, but wide and deep; while on the opposite bank the Chambezi receives the Lolingela, which descends from the spurs of the Muchinga range. A little above its mouth it has a width of over 2000 yards.

Below Kabinga's island the Chambezi continues to increase in width, but again narrows suddenly to some 400 yards, papyrus making its appearance at the same time. It is very difficult to determine the precise spot at which it enters the lake, for it splits up into numberless channels, some with open water and practicable for boats, but the greater number blocked by grass and reeds, which pass into the grassy expanse of Bangweulu on the northern horizon. The swampy tract extends to the south and south-west also, and across it winds the course of the river, which, according to the natives, passes into the Luapula, receiving, in the midst of the grassy expanse, the waters of the numerous tributaries which drain the country of Lobisa. Without a native guide, the traveller may travel for days amidst the labyrinth of similar winding channels and spaces of open water, only to be stopped at last under a barrier of grass and reeds. The whole southern part of Bangweulu is nothing but a vast swamp, through the western part of which the Luapula has made itself a channel, while to the east of the river is the same marsh and sea of papyrus in which the branches of the Chambezi with difficulty find a passage.

Of the numerous rivers of Lobisa which here join the Chambezi, the first is the Lwitikira, an important stream which takes its rise in a gorge of the Muchinga mountains. Its waters are there clear and rapid, and during the first 50 miles of its course it receives a large number of affluents, which make of this district one of the best watered tracts in Africa. The first of the larger affluents is the Mukungwa, which enters on the right bank, and, coming from the Eba mountains, a range at right angles to the Muchinga, is itself joined by several tributaries. Soon after receiving these contributions to its waters, the Lwitikira enters a swampy plain, covered with veritable forests of papyrus, in which hippopotami disport themselves. It is at this part of its course that the Lwitikira crosses the "nikas," or wide salt-plains, which constitute the wealth of the country. The river is here joined by many streams from the Muchinga range, including the Mfubushi and its branches, draining the Kasenga mountains. Below the confluence of the Mfubushi the hills which border the Lwitikira close in and form a long series of rapids. Once more free from these obstacles the river flows north-west in a navigable section of some 40 miles, during which it is deep, but has an almost imperceptible current. About the middle of this part it receives on the right bank the Kankibia, its largest tributary, with a length almost equal to its own. The Kankibia, which has its origin in the central portion of the Eba mountains, is a fine river with clear water, flowing over a granite bed, and is some 80 yards wide in the central part of its course. Soon afterwards the Lwitikira enters Lake Buali, formed by its junction with the Musundushi. This is a small piece of water 5 miles long, and marks the entry of the river into the region of swamps, within which it unites with the Lumbatwa, a large southern affluent coming from the Kapunda mountains. This river has in its lower course a width of 100 yards, and flows at a rapid rate through the surrounding sea of papyrus. A lateral branch here diverges from the Lumbatwa, and links it with the Lukulu lua Manda, a large tributary of the Luapula, while other branches probably join the Lwitikira and the Chambezi.

The Lukulu lua Manda, the first left-branch tributary of the Luapula, which it joins after crossing the eastern swamps, rises in a narrow gorge among the Kafushi wa Manda mountains. In its upper course, during which it passes through the Kapunda mountains, it is rapid, and obstructed by rocks and rapids; but on reaching the plain it becomes free from these, though as it widens out it becomes choked with papyrus, which leave only a free channel of some 6 or 7 yards in width. At the border of the swamps it receives the Lulimalu, which drains the southern extremity of the Kapunda mountains, and in its turn receives the Luwe, a stagnant grassy stream near the banks of which Livingstone's tree once stood. The natives report that during the dry season the marshes of the Lulimalu are the resort of elephants, which return to the Lukulu during the rains. It is below the junction of the Lulimalu that the Lukulu receives the above-mentioned arm of the Lumbatwa. It then filters slowly through the marshes and joins the Luapula at their southern extremity opposite Lake Kampolombo. In the midst of these inhospitable wilds rise the miserable huts of the small village of Kafufwe; while further south, watered by the last affluents of the Lukulu, is the country of Lunga, covered with trees and anthills, but, during the rains, adding its quota to the boundless expanse of marshes.

NOTE.—The accompanying map must be regarded as provisional only, as it is based on rough sketches sent home by the "White Fathers."

REVIEWS.

AFRICA.

UGANDA.*

SIR HARRY JOHNSTON'S unrivalled descriptive powers, to which the students of African geography have been so much indebted in the past, have never been employed to better purpose than in the two handsome volumes now before us, which will enable the stay-at-home public to gain a clearer conception of the conditions of Nature and Man in the Uganda Protectorate than was ever before possible. Never was the importance of work of this kind so great as at present, both by reason of the increasing number of observers, whose results can only be generally available when gathered up and garnered by a master hand, and on account of the rapid change now in progress in African conditions, which gives a special value to all records of a state of things soon to be modified by advancing civilization.

In the subject-matter of his present work, Sir Harry Johnston has been singularly fortunate, for, as he himself remarks in his preface, the region under consideration contains, "within an area of some 150,000 square miles, nearly all the wonders, most of the extremes, the most signal beauties, and some of the horrors of the Dark Continent." In presenting these to the reader, the following plan is adopted: The opening chapters of vol. i. deal in turn with the separate provinces or regions of the Protectorate, the author's object being to supply, by vivid description, a picture of "what the country looks like;" these are followed by special chapters (illustrated by excellent maps) on the history—early and recent—commercial prospects, meteorology, geology, and natural history. This concludes vol. i. of the work, the second volume being occupied entirely with the races of man, the affinities and characteristics of which are treated with great thoroughness. Amid all this wealth of material, it is, of course, impossible to give here any detailed account of the contents of the several sections, and the few passages which can be specially referred to must be taken as samples of the admirable way in which the whole country is brought before the mental eye of the reader.

In the descriptive section a most useful feature is the attention paid throughout to the types of vegetation, and the part played by them in determining the general aspect of the landscape. The eastern province, now attached to the East Africa Protectorate, included both the rift-valley † and the zone of high plateaux on its west, which the author groups under the general designation Nandi, probably to become the site of true European colonization. Here the traveller is constantly reminded of the scenery of Great Britain. "Everywhere the landscape is gracious and pleasing in a quiet, homely way, offering few violent forms or startling effects. It is thus singularly homelike, and, as it is almost entirely without native inhabitants, it seems to be awaiting the advent of another race which should make it a wonderland of wealth and comfort." It lies "at an average of 4000 feet above the Victoria Nyanza, of whose silvery gulfs and ghostly mountain coast-line glimpses at a distance of 90 miles may be caught occasionally from some breezy height or through the interstices of woods which themselves might be in Surrey." Of

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* 'The Uganda Protectorate.' By Sir Harry Johnston, G.C.M.G., K.C.B. London: Hutchinson. 1902.

† Sir H. Johnston appears doubtful as to the southward extension of the rift-valley beyond Lake Rukwa. The intimate connection between the valleys of Rukwa and Nyasa has, however, been conclusively shown by German observers, such as Bornhardt and Kohlschütter.

Kavirondo, forming part of the central province, we are told that it was once a forest-land, but now consists of breezy rolling downs, gay with flowers, "covered with the greenest of grass, and made additionally beautiful by the blending with the green of fleecy white, shining mauve, or pale pink, effects which are caused by the grass being in flower or fluffy seed." We must not follow the author in his description of Mount Elgon, with its forests, caves, and waterfalls, or of the Victoria lake, with its island-fringed shores and central stormy wastes, hardly visited by man, but may linger a moment in Uganda proper, "a country intended for switch-back railways," with its downs, marshes, and rich woodlands, often blazing with flowers, and full of colour and noise from the birds, beasts, and insects frequenting them. More enthralling is the interest aroused by the chapter on Ruwenzori and its snows, of which the author has already given a fairly full description in the *Journal;* while the account of the gloomy forests of the Semliki, the home of the Okapi, with their possibilities in the way of fresh zoological discoveries, forms a fitting conclusion to as striking a series of word-pictures as has yet appeared in African literature.

The historical chapter describes in outline the probable movements of population within the territory from the earliest times, sketching also the course of European discovery and political activity. The author is inclined to think that the early Egyptians may have had some dealings with the lands of the Nile sources, and likewise attributes to Ptolemy a greater knowledge than is conceded by some writers. A series of maps shows the ideas prevalent at various epochs respecting this part of Central Africa. While pointing out with justice that the mapping of the sixteenth and seventeenth centuries had its origin in the extraordinary southward extension of Abyssinian geographical features then current, the author is hardly correct in attributing these mistaken ideas to the Portuguese; nor do the maps assigned to 1877 and 1884 give a fair idea of the relative position of knowledge as the result of Stanley's and Thomson's journeys, the second being, in fact, Stanley's final map, with but one or two modifications in detail. Again, it appears to have escaped the author that the first knowledge of several of the names and geographical features (Naivasha, Elgon, Nandi, etc.) was due to Wakefield's researches, the results of which were published by our Society so early as 1870. These, however, are minor points, and do not affect the general value of the chapter.

The subject-matter of the chapter headed "Commercial Resources" was, to a certain extent, dealt with in Sir Harry Johnston's official report to the Foreign Office, and the main conclusions have already been summarized in the *Journal.* Regarding the soil of Uganda and the possibilities of agricultural development, it is said that the question generally put is, "What will not grow and flourish in Uganda?" Tomatoes, *e.g.*, grow quite wild, and an instance has been noted of a single plant yielding three thousand fruits in two months. As regards trade, it is stated that two subsidized German firms are pushing ahead rapidly, while British firms are inclined to hold their hands. Apart from the development of the country itself, Sir Harry Johnston thinks that the people might gain a source of wealth by going as labourers to South Africa, under proper guarantees and for reasonably short spaces of time. From the point of view of climate and temperature (a subject also touched upon in the official report), the area is divided into five regions, of which the second, or plateau region (Nandi, etc., with isolated areas on Mount Elgon and in Ankole), is considered to have a well-nigh perfect climate, while in the third or forest region (parts of Uganda proper, etc.), heat rarely causes great discomfort. In the first or arid region of the north, and the fourth or Nile region, the conditions are naturally less favourable, while the fifth, or alpine region, is necessarily of small extent. Botanically, too, five regions are defined, the poorer Somali and East African regions passing westward through the Central African region (abounding in grass, and remarkable for its brilliantly coloured flowers) into the West African forest region, which embraces much of the country north of the Victoria Nyanza as well as in the Semliki valley and elsewhere. Mr. C. H. Wright gives a provisional list of plants occurring in the protectorate, based on the materials at Kew, but it is of course by no means exhaustive. The number of common Indian genera represented seems at first sight striking, but many of these (*e.g.* Terminalia, Crotalaria, Erythrina, and others) are widely distributed over the tropics of both hemispheres. The small number of species catalogued from such orders as *Myrtaceae*, *Anacardiaceae*, and *Scytamineae*, all well represented in India, is somewhat surprising, but may no doubt be due to the chance absence of specimens of these in the collections at Kew.

The author's more special subject, zoology, is treated at much greater length, and with the aid of the admirable reproductions of his paintings and drawings, we gain a very complete notion of the varied animal life of the territory. The coloured illustrations, both of the animal and vegetable productions and of landscapes, are quite a unique feature in the work, and bring home to the mind the richness and variety of the colouring more vividly than could be done by pages of description. Especially charming are the pictures of birds, from the homely little chat, which characterizes the rift-valley, to the gorgeously coloured plantain-eaters, barbets, or flamingoes, while those of the flowers show that portions at least of Uganda form a veritable garden. Although the dark side of African life is not kept wholly in the background, the book gives a far more pleasing idea of African characteristics than has been derived from the somewhat jaundiced accounts of more than one previous traveller, and certainly induces a belief that the efforts made to develop the country have not been misplaced.

It is impossible here to give any adequate notice of the second volume, for pages would be required to give a just idea of even its most important features. The region dealt with presents an unusual number of ethnological problems, forming as it does a borderland in which most of the great divisions of the African peoples are represented. Never before, it may be safely said, has such a large body of information been brought together, whether from the point of view of physical anthropology, linguistics, or the beliefs, manners, and customs of the various tribes. The anthropometric observations made by the author and his assistant, Mr. Doggett, and summarized by Dr. F. C. Shrubsall, will long form an indispensable basis for future study, while the author's original researches into the language questions, especially with reference to the Bantu dialects, are of the highest importance for the solution of the race-problems of the continent as a whole. The very complete study which he has made of the pygmies of the Congo forest are likewise of special value in view of the practical certainty that the primitive life hitherto led by these interesting people must soon suffer considerable change, even if the race is not doomed to actual extinction. The abundant illustrations of native types will also be of great value to students. They include many which it is difficult to look at without experiencing a feeling of repulsion, but others again, such as the Jaluo or Nilotic Kavirondo, are distinctly fine specimens of humanity. The Jaluo are of special interest, both as forming a sort of Nilotic enclave amidst an otherwise Bantu population, and from the existence among them of beads which are said to be certainly not European, but are supposed to have found their way from the north in very ancient times.

Sir Harry Johnston's views as to the origin and migrations of African peoples, which have been already put forward in previous works, are here developed in greater fulness, and merit careful consideration even by those not disposed to accept them in their entirety. His estimate of the capabilities of the Negro race, when untouched by outside influence, should serve as a useful corrective to the too enthusiastic praises bestowed upon it by some of its admirers. Thus, in the history of the Hima race and its threatened absorption by its more prolific neighbours, he sees but "another instance of the attempts . . . of the Caucasian species, through its Hamitic and Libyan branches, to improve the physical appearance and intellectuality of the naturally ugly and degraded Negro."

E. H.

AMERICA.

CHARLEVOIX'S 'NEW FRANCE.'*

It is disappointing to find that these volumes are in substance only a re-issue of the late Dr. Shea's translation of Charlevoix's 'Histoire de la Nouvelle France,' published at New York in 1866 and the years following. The account of the translator, with a list of his writings, prefixed to the first volume, adds little to the value of the work; this list appears, moreover, if we may judge from the copy presented to the library of the Royal Geographical Society, to break off in the middle of a paragraph at the foot of p. xiv.

Dr. Shea, apparently with the view of abridging his undertaking, omitted the 'Journal Historique' which forms the third volume, and by no means the least interesting section, of the original work. Perhaps the fact that two English versions of the journal were in existence, one published in 1761, the other in 1763, had something to do with this decision. These translations have not, so far as we know, been reprinted; and a reprint of one of them, with a few necessary annotations, at the end of the present re-issue, would have proved acceptable to a wide circle of readers, and would have had the effect of presenting them with a complete translation of the work of Charlevoix. It is true that the 'Journal' relates to a journey undertaken by order of the French king more than twenty years before the historical portion of the work was written. This circumstance does not diminish its value; and as the author omits in the professedly historical section of the work a good deal of valuable matter which is contained in the 'Journal,' the book is obviously incomplete without it.

It may possibly be a mere coincidence that Charlevoix was engaged in compiling the work during the latter part of the thirty years' peace between France and England which followed the Treaty of Utrecht; and that its publication coincided, or nearly so, with the French declaration of war against England in 1744. More probably, however, it was written to order at a time when France cherished the hope of recovering her position in North America; a suggestion strengthened by the fact that the archives of the Ministry of Marine were ransacked to furnish it with the excellent maps which at the present day constitute its chief value. These maps, executed by Nicolas Bellin, the royal cartographer, were an immense improvement on any maps of French North America previously published, and are still interesting and valuable. It would be curious, but for the circumstances of the publication, that Bellin utterly ignores the curtailment which the French dominions had suffered at the Treaty of Utrecht; for Hudson's bay, the whole of Newfoundland, and even Nova Scotia with the peninsula of

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* 'History and General Description of New France.' By P. F. X. de Charlevoix, S.J. Translated from the original edition and edited with notes by John Gilmary Shea. With a New Memoir and Bibliography of the Translator, by N. F. Morrison. Six vols. London: Francis Edwards. 1902.

Acadia, are coolly represented as still forming part of New France. The maps, eighteen in number, are reproduced in a style which leaves nothing to be desired, and the book, notwithstanding its incompleteness, should find a place on the shelves of many libraries on both sides of the Atlantic.

E. J. P.

POLAR REGIONS.

Dr. Nansen's Third Volume of Scientific Results.

It is difficult to attempt to summarize the immense mass of material contained in this very substantial volume,* the contents of which prove Dr. Nansen's determination to subject all the results of his expedition in the *Fram* to the most exhaustive criticism. There are two memoirs of unequal length. The later and shorter, on "Hydrometers and the Surface Tension of Liquids," is the account of an interesting physical research as a result of which the use of stem-reading hydrometers, on whose indications our knowledge of the salinity of the ocean very largely depends, is condemned except when extraordinary precautions are taken. It would scarcely be appropriate here to discuss the experiments which have led Dr. Nansen to take up a position so completely opposed to that of such an authority as Mr. J. Y. Buchanan; but without accepting as final the judgment passed on partially immersed hydrometers, we are quite prepared to believe the excellent character given to the newer form of instrument, the hydrometer of total immersion.

The main interest of the volume to geographers is the discussion of "The Oceanography of the North Polar Basin," which occupies 427 large quarto pages, and is illustrated by 33 plates. The observations are described in great detail, supplemented by the discussion of many experiments made since the return of the expedition, and the results are finally treated so as to elucidate the circulation of the water in the Arctic sea. It may be the simplest way of explaining Dr. Nansen's method and its outcome if we refer to the chapters in their order.

Part I. deals with the temperature of the water in the North Polar basin, treating first of the instruments, their construction, corrections, and method of use, and second of the observations. A large part of the discussion is occupied with the corrections necessary in order to obtain temperature readings to one-hundredth of a centigrade degree. We cannot agree with Dr. Nansen that such high accuracy is possible in oceanographical work, and we would be well pleased to have readings that could be absolutely trusted to one-twentieth of a degree. The observations include surface readings made every four hours on the voyage out, and, subsequent to the freezing in of the *Fram*, daily or at longer intervals, in a hole broken through the ice. These are set out at length in nearly forty pages of tables. The deep-sea temperatures are then given, but these are not so numerous as they would have been if the great depth of the water had been suspected beforehand. As is well known, a wire sounding-line had to be prepared on board, and as it gradually wore out, great care had to be exercised to avoid the loss of instruments. During the drift the soundings were taken from the ice. On nine occasions temperatures were obtained from depths exceeding 1000 fathoms, and one of these was in 85° 28′ N.

Part II. treats of the specific gravity and salinity of the water of the North Polar basin. The methods employed are described and criticized, and nearly fifty pages are occupied with the tables of hydrometer readings, the accuracy of which did not satisfy Dr. Nansen, although they certainly form a distinct and valuable addition to knowledge.

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* 'The Norwegian North Polar Expedition, 1893-1896. Scientific Results.' Edited by Fridtjof Nansen. Vol. iii. London: Longmans, Green & Co. 1902.

Part III. is entitled "The Circulation of the North Polar Basin." It commences with a statement of the final values of the temperature and salinity observations made at various depths below the surface during the expedition, which differ from those published in the earlier part by the application of some additional corrections. The conditions of the water in the Barents and Kara seas are next discussed, the observations on the *Fram* being reinforced by simultaneous observations from a Russian surveying-vessel, and by reference to the earlier work of the *Willem Barents*, and also to later work. The Kara and Siberian seas are then considered, but the data are few, as little but surface observations could be made from the *Fram*. The most interesting observation in the shallow Siberian sea was that neither the work of the *Fram* nor that of the *Vega* proved any distinct easterly current along the coast from the great Siberian rivers, which seem on the contrary to set up a movement towards the north-west.

Interest is naturally concentrated on the section dealing with the North Polar basin itself, that great unknown sea across which the drift of the *Fram* made a line of observations possible for the first time.

The main result is very clearly established by the observations, and it may be stated in Dr. Nansen's own words—

"The uniformity with regard both to temperature and salinity, especially of the deep water of the whole of this sea, is striking, as is also the great and sharply defined difference between the shallow water, above 200 metres, and the deep water, deeper than 250 metres. In all the series we have a minimum of temperature at from 70 to 80 metres, and a maximum at from 300 to 400 metres, below which the temperature gradually sinks to a second minimum near the bottom. The salinity, however, increases rapidly from the surface to about 200 or 250 metres, where it is about 35·2 °/₀₀, and thus it remains, almost unaltered, to the bottom.

"It at once becomes evident that we have here two different kinds of water. The surface of the sea, between 0 metres and 200 metres, is covered with water of low salinity and low temperature, the *genuine polar water;* while the sea from 250 metres to the bottom is filled with water of a very high salinity (35·2 °/₀₀ or 35·3 °/₀₀) and of a relatively high temperature, being above zero centigrade between 200 or 250 metres and 700 or 900 metres. From 400 metres or 500 metres the temperature gradually decreases downward, yet without reaching the low temperature of the upper polar water. The comparatively warm and saline water has evidently its direct origin from the *Gulf Stream* of the Atlantic ocean."

The fresh cold upper layer of water is traced to its origin in the dilution produced by the great rivers of Siberia, the salinity being lowest near the continental shores, and gradually increasing towards the north.

The intermediate warm water appears to be that of the Gulf Stream entering the North Polar basin, and deviated by the Earth's rotation to the right, passing eastward along the continental slope; but, cooling as it goes, it ultimately becomes cooled down to the temperature of the surface and spreads through the deepest part of the basin underlying the still imperfectly cooled Gulf Stream water that continues to flow in. The deep cold water probably circulates very slowly, and may not be renewed once in a century or more. The slight rise of temperature in the very deepest layers is attributed to the effect of the internal heat of the Earth; and taking all considerations into account, the circulation of the water as a whole must be of an extremely complicated kind.

The evidence for the existence of a permanent surface current in the North Polar basin is treated very fully with the aid of a number of maps showing the direction of the wind in relation to ice-drift. The periods when the wind resultant was zero, *i.e.* periods in which the same amount of wind had been registered from diametrically opposite directions, were determined, and on examining the movement of the ship embedded in the ice during these periods, it was found to show a drift of from 0·45 to 1·00 sea-mile in twenty-four hours, at first north-westerly, then westerly, and subsequently south-westerly and nearly south. The varying directions, when plotted on a globe, will be found to give a nearly straight line across the North Polar basin, from the Siberian to the Greenland side, and it is noticeable that the rate of drift increases towards the west. The whole question of wind-drift and currents is discussed theoretically, and great stress laid on the influence of the Earth's rotation in deviating the currents to the right, an effect which, it is pointed out, increases with the depth. As a final result, Dr. Nansen concludes that a vessel entering the drifting ice north or north-east of Bering strait would be carried much further north than the *Fram*, and with a greater speed; but that beyond a certain latitude the current would slacken in its velocity.

In discussing the causes of the circulation in the polar basin, Dr. Nansen dissents from Prof. Pettersson's views as to the supreme importance of ice-melting as a motive power, and in referring to secular changes of climate in the far north, he expresses the opinion that a higher sea-level, admitting a greater volume of warm Atlantic water, would possibly account for the more genial episodes to which the shells on the raised beaches of Franz Josef Land bear evidence.

The maps illustrating the memoir are on a large scale, and very clearly drawn; one of the configuration of the bed of the Barents and Kara seas is peculiarly interesting, as showing the complicated submarine topography of the margin of the polar basin, a subject on which we understand Dr. Nansen will have more to say on a later occasion. Taken as a whole, this memoir is perhaps the most important contribution to oceanographical science since the work of the *Challenger*.

THE MONTHLY RECORD.

EUROPE.

The Austrian Hydrographic Service.—The Central Bureau of the Hydrographic Department was established in Vienna in 1893, for the purpose of dealing with the constantly recurring dangers from floods in different parts of Austria, by organizing a hydrographical service on scientific principles, drawing up proper regulations, and taking practical steps to minimize the loss and damage occasioned. The annual reports of the department are of great geographical interest, from the immense amount of data they contain relative to the behaviour of streams and rivers. The seventh report, just issued, contains the results of observations for the year 1899. The number of rain-gauge stations has increased from 861 in 1893 to 2819 in 1899—128 having been added during the year—and the number of stations recording water-level from 493 to 1271. Measurements of snow-line were made at 984 places in the course of the year. The area under observation included 300,000 square kilometres (115,800 square miles) within the country, and 120,000 square kilometres (over 46,000 square miles) beyond the frontier, including Hungary and Bosnia. Data for the external areas were supplied by the departments of the respective districts. The rainfall measurements were made, in the great majority of cases, with identical instruments, and according to a uniform system, and the irregularities still existing in Bohemia, Moravia, and Galicia, are being steadily reduced in number. The observations are classified according to river basins, so that the fifteen sections of the report vary in length from 50 to 320 pages; the details of each are represented graphically by diagrams and sections, and a map on a scale of 1: 750,000 shows the distribution of rainfall. As points of special interest in 1899, we may note the following. No rain was recorded at any station in Austro-Hungary on March 13 and 14, or on the first days of November. Riesenhain, in the Riesengebirge, Northern Bohemia, had the greatest number of rainy days (over 1 mm. of rainfall), and Tscherms, near Meran in Southern Tyrol, had the least, the numbers being 203 and 44. The heaviest falls occurred near the coast, a Dalmatian station recording more than 20 mm. on 60 separate days. In the March (Eastern Moravia and Lower Austria) the rainfall did not amount to 20 mm. on a single day. The mean rainfall over the whole area was 980 mm. for the year, about 10 per cent. above the long-period average. The water-level values are calculated for a "hydrological year" from December 1 to November 30, with the object of including the whole period of winter or ice conditions in one season. The generally mild winter of 1898–99 did not occasion extensive freezing of the rivers, but only the Lower Adige, the Isonzo, and the Dalmatian streams remained entirely free from ice. The melting time in spring was marked by strong oscillations, and a general tendency to rising waters; in some places the Adige reached its maximum in May, but the Drave, Save, Upper Rhine, Upper Vistula, and the coast streams only attained their highest as the result of heavy rains in July. The Danube oscillated above its mean level during the whole of July, under the influence of snow melting in the mountains. In September occurred the great floods, which were the most disastrous of the nineteenth century, exceeding even those of 1897. During the same months the Dalmatian streams were unusually low.

ASIA.

The Hejaz Railway.—In his report on the trade of Damascus Mr. Richards gives some details concerning the Hejaz railway, which, he thinks, will at least be carried as far as Ma'an, a distance of 290 miles. The entire distance between Damascus and Mekka is 1100 miles, and the most favourable estimates of the cost of construction are £5,000,000 sterling, while by others an expenditure of twice this amount is thought probable. The absence of water, desert conditions, and hostility of the Bedawin render the task difficult, but it must be admitted that the progress made during the last fourteen months has not been unsatisfactory. On one section of the line, from Mezerib, the terminus of the already-existing Hauran railway, to the 30th kilometre, the work of construction has been carried on by some 2000 of the Imperial troops, who do as well as any of the workmen engaged, with the exception of the best of the foreigners, who are for the most part Italians. It is hoped that the line will be completed as far as Ain Zerka—distant 62 miles from Mezerib, and therefore 125 miles from Damascus—by September of the present year.

The Connection of Ceylon with India.—Recent railway development both in India and Ceylon has brought the question of inter-communication once more before the public. On the Indian side the opening of a new line from Madura to Mandapam carries the railway practically to one end of the bridge, while in Ceylon a line is now under construction running northwards to the extremity of the island at Jaffnapatam. From this latter it is suggested that a branch line should be made from Madawachi to the island of Manaar, the other end of the bridge, and if the South Indian Railway be extended to Point Ramen, and thence by a causeway of 1¼ mile in length to the island of Rameswaram, there would be only a short stretch of intervening water—about 40 miles—to cross. The steamer service would be most favourably circumstanced, running on the south side of the islands during the north-east monsoon and on the north side during the south-west.

It is thought that considerable development of the trade of Southern India and Ceylon should follow the completion of this project.

Surveys and Scientific Work in French Indo-China.—During his governorship of French Indo-China, M. Doumer has bestowed much attention on the prosecution of the mapping of the territory, which has been put into the hands of a "Service Géographique," of which Colonel Lubanski is director. According to a note in the June number of *La Géographie*, a map of the delta region of Tongking has been undertaken, on the scale of 1 : 25,000. This map will be based on precise geodetic methods, and when complete will embrace seventy-two sheets. By May last, 7280 square kilometres (2800 square miles) had been surveyed, and it is expected that the first twelve sheets will be published within the next few months. The field-work will probably be completed in 1903. Several other large-scale maps of portions of French Indo-China have either been published or undertaken. A scheme has also been set on foot by M. Doumer for the scientific exploration of the territory from the point of view of geology and mineralogy, zoology, botany, and anthropology. At the head of the organization there will be a director holding office for three years at a time, while two experts will be attached to each of the above sections.

Kang-wha, Korea.—This island, on account of the strategic importance of its situation off the west coast of Korea, at the mouth of the river on which stands Seoul, has had a stirring history extending over at least a thousand years. In the Proceedings of the Korea branch of the Royal Asiatic Society, the Rev. M. N. Trollope prefaces an account of the part it has played in history, notably during the Mongul invasion of the thirteenth century, the Manchu invasion of the seventeenth, and the French and American expeditions in recent times, by a short geographical description. Kang-wha is about the same size as the Isle of Wight, and is crossed from west to east by four parallel ranges of mountains. The broad fertile valleys, with lateral coombe-like hollows, which lie between these ranges, are well cultivated, and a good deal of land at the mouths of the valleys has been reclaimed from the sea for agriculture by the erection of massive dykes. In rural parts, the dwelling-houses are often hidden away in the hollows, in order to be sheltered from the piercing north-west winds—a practice which gives the country the deserted aspect when viewed from a distance that is noticeable in many parts of Korea. Agriculture is the staple industry of the population, which probably numbers slightly over 30,000, though a small percentage of the people are employed in stone-quarrying, mat-making, fishing, etc. The city of Kang-wha stands to the north-east of the centre of the island, and, in spite of the fact that it consists chiefly of straw-thatched houses, must present quite an imposing and picturesque appearance, with its fortified city walls, pavilioned gateways, and bell-kiosk. Its present military importance, however, does not nearly approach that of former days, since enemies desiring to capture Seoul would probably now march *viâ* Chemulpo, and modern artillery would prevent its being a safe refuge for king or government. The city contains seven Buddhist monasteries, and just outside it is the famous one of Chun-deung Sa, surrounded by a battlemented stone rampart. The present influence of Buddhism is, however, very slight, and many of the monasteries and temples, once numerous in the island, have long since perished. Altogether, Kang-wha appears to have lost the important position that it once occupied in the estimation of the Koreans, and with this many of the glories of the past, but it is a mine of wealth for those interested in Korean history.

AFRICA.

Antiquities of the Egyptian Sudan.—With the re-establishment of settled government under British auspices in the Egyptian Sudan, it is to be hoped that new light will be thrown by the researches of competent students on the antiquarian remains scattered over a large part of the area, which, though studied to some extent by travellers such as Cailliaud and Lepsius in the early part of the nineteenth century, still offer a most promising field for further investigation. The importance of the old Ethiopian kingdom, of which Meroe was the capital, and which possessed a civilization closely related to that of later Egypt, has long been generally recognized, but it is not so widely known that this had its successor, to some extent, in a Christian kingdom which flourished here for some centuries after the conversion of the Nubians to Christianity. The most important remains dating from this epoch are at Soba, on the Blue Nile, 30 miles south of Khartum, an investigation of which has lately been carried out by Colonel Stanton, Governor of Khartum, who has entered into their study with much enthusiasm. Some account of the discoveries so far made is given in an article on Khartum by Mr. John Ward, F.S.A., in the August number of the *Monthly Review*, who gives reproductions of photographs showing a Christian basilica and other buildings, marking a transition from the Egyptian to the Roman style. Colonel Stanton also reports ruins in the south of Kordofan, which he is inclined to ascribe to the same epoch, and he has apparently found traces of Christian influence at the well-known ruins of Naga, from which a highway—also strewn with ruins—seems to have led across the desert to Soba. It is to be hoped that steps will soon be taken by the authorities for the proper preservation of such antiquities as may yet be discovered.

New Ascent of the Volcano Kirunga Cha Niragongwe.—Recent numbers of the *Deutsche Kolonialzeitung* (June 12 and 19) contain a graphic account of a new ascent of the western volcano of the Kirunga group, generally known as Kirunga cha Gongo, but which the writer of the narrative, Lieut. Schwartz, says should properly be called Kirunga cha Niragongwe. The ascent was made, apparently, last December, in company with Dr. Kandt, with porters and native guides. After a march across the gently rising plateau from which the volcanoes rise; camp was pitched at the foot of the mountain on its south-east side. Even here the cold mist rendered two thick blankets acceptable at night, although the mountain lies almost on the equator. The following day the march was resumed, in spite of rain, up the bush-covered slopes, use being made of a path apparently cut by elephant-hunters, which enabled the party to arrive the same evening at the open slopes above the forest zone, whereas the passage of the latter had occupied Count von Götzen, who made the first ascent, three and a half days. During the march, after the upper level of the clouds had been passed, the rain ceased, and views were obtained into the extinct southern crater of the mountain, the walls of which were steep and wooded, and over the plain to the south, which with its many small extinct craters recalled a lunar landscape. Camp was pitched above the trees, the night scene being extraordinarily impressive, and the final ascent to the main crater made the following day. After a time the Wahutu guides remained behind through dread of the spirit of the mountain, and even the regular caravan porters were probably only reassured by the presence of the Europeans. The account of the crater and its environs agrees on the whole with Count von Götzen's, but the depth of the crater is estimated at only some 350 feet. The volcanic vent is said to be of the shape of an 8, which would seem to imply that the two shafts seen by Von Götzen have since coalesced. The crater walls are composed of very well-defined strata, black, whitish, and red in colour. The descent of the mountain was more difficult than the ascent, owing to the steepness of the broken lava-slopes. The altitude of Kirunga cha Niragongwe has been found by Captain Herrmann (by trigonometrical measurements) to be 11,200 feet, while that of the higher eastern peak, Karisimbi, is 14,760. From a recent number of the *Deutsches Kolonialblatt* (August 1) we learn that Lieut. Schwartz has also ascended Mt. Namlagira, from which lava-streams still continue to flow.

Return of the Kivu Delimitation Commission.—The German Commissioner, Captain Hermann, has now reached Europe, bringing with him a large amount of new material for the mapping of the Kivu region. According to the *Deutsche Kolonialblatt* for August 15, the triangulation, for which a base line was measured near the station of Usumburu, extends from the north end of Tanganyika along the eastern shore of Kivu (including the island of Kwijwi) to the summits of the Kirunga volcanoes and the intersection of 30° E. with 1° S. The map, much of which has been constructed on the spot, will be on the large scale of 1 : 100,000, and will include the results of Dr. Kandt's surveys.

Count Wickenburg in East Africa.—Count Wickenburg has been unable to carry out his intention (*Journal*, vol. xix. p. 216) of extending his explorations in East Africa, after his first crossing of the Galla and Somali countries, to the region between Lake Rudolf and the Nile. After making his way across the Tana to Ukamba, and being much hindered by scarcity of water, he made his way to the upper Tana, but was finally forced to return to the coast, owing to the outbreak of the plague at Nairobi and the enfeebled state of his caravan.

The Shrinkage of Lake Nyasa.—Mr. Commissioner Sharpe's report on the British Central Africa Protectorate, just issued by the Foreign Office, has some important notes on the alteration in the level of Lake Nyasa, of which for some years past careful records have been kept. On April 1, 1902, the lake was lower than it has been for six years, which points to difficulties in the navigation of the Shire river during the months of August, September, and October. On April 25, 1902, the level was 3 feet 6 inches below that on the same date in 1897. Monthly soundings are taken on the Fort Johnston bar, where the Shire leaves the lake, and records have been kept of its condition since 1895. It is possible that there may be some silting up during the dry season, but Lieut. Cullen considers this must be very slight. He thinks, however, that there are regular tides on the lake, though the rise and fall may not be more than 5 or 6 inches. Fort Johnston bar was impracticable for the lake steamers from August, 1901, to February, 1902. Mr. Sharpe remarks upon the very clear and distinctly defined water-mark which can be seen on the rocks all round the lake, and is by measurement 11 feet 7 inches above the present level, and he thinks that at some previous period before the advent of Europeans there must have been a sudden subsidence of the lake. The rainfall throughout the protectorate during the past season has been a good one.

The Mountain Flora of Northern Nyasaland.—The geographical and ethnological results of the German expedition to the countries north of Lake Nyasa, organized by the aid of the *Wentzel-Stiftung*, have already been alluded to in the *Journal*. The results of the botanical researches carried out by Herr Goetze, which formed the main object of the expedition, are summarized by Prof. Engler in the *Sitzungsberichte* of the Prussian Academy of Sciences (February 27, 1902). The region of the Kinga or Livingstone range, to which especial attention was paid, had previously been practically an unknown region from a botanical point of view, so that the results in this direction are of much interest. Prof. Engler divides the region in question into eight distinct botanical formations, beginning with (1) the alluvial land of the Konde plain, the lowest part of the whole area, and passing through the formations of the lower slopes to those of the highest summits. Up to 1700 metres (5580 feet), and in places up to 2000 (6560 feet), steppe-like formations are the prevailing feature, but in ravines exposed to the influence of the moisture which ascends from the lake, and along river-banks on the plateaux, moist mountain forest occurs (No. 2 of the series). The steppe formation of the lower grounds (No. 3) consists chiefly of grasses, but contains some bush and trees, including acacias, Borassus, and a new species of Hyphæne palm. Above 1200 metres (3940 feet) we find a xerophilic formation of mountain bush and dry forest (No. 4), containing forms of wide distribution in East Africa, and even extending to Angola. This dry region ascends in places to a considerable altitude, but elsewhere, above 1400 metres (4600 feet), mountain grass-lands, with interspersed trees and bush presenting a park-like aspect (No. 5), are common. The next two formations (Nos. 6 and 7) occupy similar zones of altitude. The high-level forests, which begin with the appearance of bamboos at 2100 metres (6900 feet), are sometimes continuous with the lower moist forests, but more often a xerophilic formation intervenes, the moisture from the lake not making its influence felt until near the summits of the mountains. The character of these forests varies on the two versants of the mountains; thus species of juniper and podocarpus, which are common in ravines on the side towards Lake Nyasa, are almost absent on the northern side. These upper forests contain many species found in Abyssinia, Kilimanjaro, and elsewhere. The seventh formation is that of the upper mountain pastures, which are especially rich in species on the plateaux; while the eighth and last, which occurs above 2700 metres (8850 feet), consists of the stunted bushy plants which find a footing among the rocks of the mountain summits.

The Kingdom of Loango.—Mr. R. E. Dennett, who has so long resided as a trader in the region of the Lower Congo, and is well known for his writings on the Fjort, or Fiote, the inhabitants of the old kingdom of Congo, sends us some notes on the kingdom of Loango (inhabited by the Bavili) and neighbouring districts, in which he has lived during the past eight years, his earlier researches having been made principally more to the south. He begins by referring briefly to the vice-kingdom of Kakongo, lying just north of the Congo river, which, together with Loango and still more remote districts to the north-east, he considers to have been an integral part of the old Congo kingdom at the height of its power. One of the Kakongo provinces, Ngoyo, was, in fact, he says, the "mother province," as Sonyo, south of the Congo, was the "father province" of that kingdom. It is the inhabitants of this province who have become generally known as Muserongo (a corruption of Mu-si-Ngoyo, "a man of Ngoyo"). The country is traversed by four roads, called by the people Nzila Nyambi, or "God-made roads," which run north, south, east, and west from the central province of Kakongo. The kingdom of Loango is reached by the Nzila Bavili, or north road, which eventually leads through the province of Chindendi across the Loango Luisi river to the holy ground or meeting-place of Buali, the central province of Loango. Here again is a meeting-point of roads, one running north to the Balumbu country (outside the Fjort domain), another east to that of the Bateke (Nteke), who claim kinship with the Bavili. Mr. Dennett considers that this shows that the Fjort country extended north to the borders of the Bapindi, of whom the Balumbu formed a section, and east to the eastern limits of the Bateke —that is to say, north to about 3′ 30″ S. and east to the Alima river. Further south he is inclined to place the limits of the old kingdom of Congo somewhere near Ambriz and at the Kasai. The central province of Loango—Buali—contains the town and sacred grove (Chibila) of the elected ruler or "Maloango." It is surrounded by three coast and three interior provinces, the latter adjoining the Mayombe country ("land of slaves"), inhabited by the Bakunu and Basundi, both of whom own allegiance to the chief of Loango. Each of the six provinces is ruled by a chief, whose title is formed by the prefix "Ma" (=Mani Fumu, "son of a prince") placed before the name of the province. With the paramount chief, and with each of these minor chiefs, a ruler called Mambona (always a slave) is associated, who is in some ways on an equal footing with the first. Each province is divided into townships, each under a "Kongozovo." This subdivision is closely connected with the religious and social system of the people. Mr. Dennett endeavours, with the aid of the Abbé Proyart's map, to assign the limits of the separate provinces on the coast. He says that while the native kingdom to the south of the Congo has long been a prey to anarchy, and Kakongo and the Bateke country have shared the same fate, Loango alone has preserved its ancient form and traditions, owing, the people say, to the protection afforded by the Mayombe forests. It has, however, been unwisely broken up between the spheres of France and Portugal. On the coast of Loango, low-lying country alternates with hilly tracts, while towards the interior park-like undulating country gives place, as it rises gradually to the mountainous zone of Mayombe, to increasingly dense forest. The modern alluvium is traversed by bands of quartz, but this only contains traces of iron and copper, not gold, though this has been found in the conglomerate of the Kwilu. Iron (hæmatite) is the most plentiful mineral.

Lieut. Lemaire's New Expedition.—The intrepid leader of the Belgian Katanga expedition has undertaken a new series of researches in the Congo basin, and left Belgium at the end of July for Boma, with his assistants MM. Paulis and Weber. He intends to proceed to the extreme north-east corner of the Congo State by way of the Itimbiri and the Welle.

Wild Domestic Animals on São Thomé.—*Globus* quotes from the *Tropenpflanzer* (1902, No. 4) an account by A. F. Moller of various domestic animals which have now run wild on São Thomé. They include poultry, hogs (which at times even attack man), goats, dogs, and in the south of the island a few oxen. Almost all are extremely shy, and avoid the neighbourhood of villages, while their congeners, still in a state of domestication, often show a great inclination to run wild. The goats are found chiefly in the higher levels, especially on the Pico, from 4500 feet upwards. Tame doves, although they often mix with wild ones, do not become wild, nor do turkeys, but guinea-fowl do with great readiness.

AMERICA.

Mr. J. W. Tyrrell's Explorations between Great Slave Lake and Hudson Bay.—An important surveying expedition, carried out by Mr. J. W. Tyrrell in 1900 across the barren grounds of Northern Canada, is described in the Report of the Surveyor-General for 1900–1901 (Annual Report, Department of the Interior, Part iii.). The region in question was, in part, the site of the early journeys of Samuel Hearne and Sir George Back, but, since the date of the latter little had been done to extend our knowledge until 1893–94, when the unknown area was much reduced by the work of Messrs. J. B. and J. W. Tyrrell (*Journal* vol. vi. pp. 438 *et seq.*). A large area west of the Doobaunt river still, however, remained unknown, and it is this which has now been surveyed by Mr. J. W. Tyrrell, assisted by Mr. C. C. Fairchild. The outward route led from Edmonton, north to the Great Slave lake, over which a sledge journey of 250 miles was made on the ice. The eastern extremity of the lake was reached on May 9, and the real work of the expedition began. The most easterly bay, named by Mr. Tyrrell Charlton harbour, which is about 16 miles long, and is connected with McLeod bay by a deep channel less than a mile in width, was carefully surveyed, and an astronomical determination was made of the position of Pike's portage, the initial point of the route survey. Old Fort Reliance, formerly Back's winter quarters, is now a complete ruin, though the surroundings form a beautiful natural park. During a survey of the Lockhart river, which enters Charlton harbour, the Parry falls, so enthusiastically described by Back, were visited, but, though beautiful, were found to be on a very much smaller scale than had been supposed by that traveller. The goods were meanwhile transported by the "Pike portage" route (which follows a chain of eight small lakes) to Artillery lake, the country becoming gradually less wooded, the most northerly grove being reached in 63° 4′ 10″ N., on the east shore of Artillery lake. Along the portage the country was composed of rocky hills of granite and dolomite. Artillery lake, which lies at an elevation of 1188 feet, or 668 above the Slave lake, has bold but desolate shores, and contains islands composed chiefly of dolomitic limestone with quartz. Its waters abound in particularly fine trout, and the Indians have a story that huge fish 20 to 30 feet long are found in it. Fur-bearing animals are also numerous, and the meat supply, furnished chiefly by the caribou, is abundant. From the lake an excursion was made eastward across the "height of land," which was found to lie only 7 miles off, at an elevation of 1188 feet, a new lake (Douglas) beyond it being drained to the north or east. The main route led north by the Kasba river and lake into Lake Clinton Colden, where the last ice met with in the outward journey was seen. The country was here much less broken and rugged, while the only trees seen were a few ground willows. From the south-east extremity of the last-named lake, the height of land was crossed by short portages, and a string of lakes was then followed to the Hanbury river. This runs through a wild and grand chasm (Dickson canyon), beginning with a fall of 50 feet, and below it a soft white sandstone formation was met with, the country assuming a more verdant appearance, affording luxuriant feeding-grounds for musk-oxen, while trees and flowering plants became more common. The Hanbury enters the Theron river, which had hitherto been known only from reports given to Back. It proved a large river, with a volume of 50,000 cubic feet per second at the junction, and its grassy or spruce-covered banks abounded with musk-oxen, caribou, etc. Mr. Tyrrell saw signs of ancient habitation, and believes that the valley was the site of the flourishing Indian settlement described by Hearne. On the Theron the party separated, Mr. Fairchild continuing the survey past the junction of the Doobaunt to the mouth of Chesterfield inlet, into which the river empties itself, while Mr. Tyrrell turned back towards its upper waters, hoping to make his way to Lake Athabasca. This proved impracticable, and, after visiting the upper Theron, Mr. Tyrrell made his way back by a more southerly route to Artillery lake, where the whole party once more united. On the way he had a most unpleasant experience, being overtaken by stormy weather, with deluges of rain and snow, while striking alone across the desolate barren grounds. Owing to the weather and the intricacies of the lake and river system, he was out sixteen days, though the distance in a direct line was only 80 miles. The Theron river—one of the finest in Canada—is navigable for river steamers 550 miles from Hudson bay, and its timber supply and herds of musk-oxen should be of considerable value, though the district is hardly a desirable one as regards agriculture. The report is accompanied by a large-scale map in twenty-two sections, and a number of excellent photographs.

Boundaries of United States Territorial Acquisitions.—The report of a conference upon the boundaries of successive acquisitions of territory by the United States was issued in July, 1901, as a census bulletin. The first map in the Statistical Atlas of the United States, based upon the results of the eleventh census, shows the boundaries of successive acquisitions of territory by the United States, but in a few particulars the map was found to differ from one published for the same purpose by another Government Department, and the Director of the Census Office thought it advisable to appoint a committee to examine and harmonize these discrepancies. Finally, a conference for the purpose was arranged between the representatives respectively of the Department of State, of the Coast and Geodetic Survey, the Geological Survey, the Census Office, and the Library of Congress, whose final conclusions, it is satisfactory to learn, as clearly set forth in their report and accompanying map, were reached, with but one solitary exception, with entire unanimity. The boundaries which formed the subject of discussion were as follows: (1) The line separating the territory of the United States, prior to 1803, from the Louisiana Purchase, and stretching between the Mississippi and the Lake of the Woods; (2) the western boundary of the Louisiana Purchase; (3) the north-western boundary of Texas; (4) the southern boundary of the Mexican cession of 1848. Besides defining these boundaries, the conference came to the conclusion that the region between the Mississippi river and Lakes Maurepas and Pontchartrain to the west, and the Perdido river to the east, should not be assigned either to the Louisiana Purchase or to the Florida Purchase, but marked with a legend indicating that between 1803 and 1819 the title to it was in dispute.

Exploration in British Honduras.—We have received an advance copy of a newspaper article describing an expedition recently undertaken by Mr. T. Fenwick, merchant, of Belize, for the purpose of adding to our knowledge of the still little explored interior of the colony of British Honduras. The account is written in a popular style, and gives somewhat vague indications of the direction taken by the route; but it is claimed that districts never before visited by white men have been brought to light by the expedition. With six companions, Mr. Fenwick proceeded to the South Stann creek, and there hired a dorey, or native log-boat, with which the river was ascended to the Cockscomb mountains, amidst the difficulties incidental to the navigation of a tropical stream obstructed by fallen trees, which had to be cleared away by the machetes of the party. The course of the river is very tortuous, and camping on its banks was rendered most unpleasant by reason of the torrential downpours which occurred regularly each night. Two peaks of the Cockscomb mountains were ascended amid great difficulties, and the northern and southern sides of the range explored without a trace of inhabitants being discovered. The peaks were named respectively Joseph Chamberlain and Lady Wilson (after the wife of the governor), but their position relatively to those ascended and named by Governor Goldworthy's expedition (*Proc. R.G.S.*, 1889, p. 542) is not made clear. A west-by-south direction was next taken across a hitherto unknown tract, to which the name King Edward's Land was given, a range of mountains being reached which was found to be distinct from the Cockscombs. Still another range of "very considerable altitude" was found more to the south, running west and south, and extending in part into Guatemala. It was named Queen Alexandra's mountains. The return journey was effected amidst great hardships, provisions running short, so that the leader was only saved from starvation by the providential arrival of a relief party from Seven Hills. He speaks enthusiastically of the healthiness of the climate and the richness of the soil, and urges the suitability of the colony for settlement by small capitalists.

The National Geographic Society's Expedition to Martinique.—The first results of the expedition sent by the National Geographic Society of New York, under Messrs. Hill and Russell, to study the volcanic phenomena in the West Indies, have appeared in the July number of the *National Geographic Magazine*, which is wholly devoted to the subject. Besides accounts by the above-mentioned geologists on the phenomena observed by them on the spot, there are reports by specialists on the volcanic rocks collected, and on the chemical analysis of the *ejectamenta*, as well as a collection of data on the range of the dust-falls. We hope to refer more fully to these reports in our next number.

The Historical Cartography of the Coasts of Guiana.—While the question of the boundary between French and Brazilian Guiana was still under dispute, a careful study of the historical and cartographical testimony respecting the river of Vincent Pinzon, on the identity of which the whole question turned, was undertaken by Prof. Vidal de la Blache, who has lately published the results of his inquiries under the auspices of the Université de Paris. Although the question has been removed from the sphere of practical politics by the recent award, which has fixed the boundary between the two territories on the coast at the mouth of the Oyapok, M. de la Blache's monograph is none the less of importance from the point of view of historical geography. The investigation has been made in a scholarly way, and the result is to throw a clear light on the development of the cartography and general knowledge of the Guiana coast from the sixteenth century onwards, the numerous reproductions of old maps being a valuable feature. The writer begins by examining the circumstances of the voyage of Pinzon along the Guiana coast, proceeding then to discuss the earliest maps in which the discoveries then made were recorded. These were of the Seville school, brought out under the auspices of a sub-department of the Casa de la Contratacion, and as Pinzon himself was associated with the work of this office, the maps (which belong to the first half of the sixteenth century) possess a special authority as regards his voyage. They all agree in placing the river Vincent Pinzon just beyond a cape situated a little distance north of the equator, and their influence may be clearly traced in other maps, such as those of Mercator and Philip Apianus, and the well-known map inserted by Hakluyt in his collection. On the Portuguese and French maps of the period the river of Vincent Pinzon rarely appears, but in its place is a Rio fresco or Rivière dolce, the former of which we learn from an official Portuguese document to be the name sometimes given in Portugal to the river of Vincent Pinzon. There is a "Rivière de Vincente" further north on some of these maps, but this, M. de la Blache holds, had no connection with Pinzon's river. With the voyages of the English and Dutch a new nomenclature appears on the maps, but Keymis's narrative and the maps based on it still connected Pinzon's name with a river occupying a similar position to that of Pinzon's river on the Spanish maps. The position of this river to the north of the most prominent cape of this part of the coast is explained by the undoubted fact that a branch of the Araguari formerly entered the sea to the north of the North cape. As regards the terminology employed in the Treaty of Utrecht, M. de la Blache shows that the word Japok, there once used as a synonym of Pinzon's river, was by a special usage of the French applied to a region quite distinct from that of the Oyapok, as is shown, *e.g.*, by Mocquet's narrative. The roots which form the word occur, in fact, at various points along the Guiana coast. The testimony of maps immediately after the date of the treaty is also adduced in support of the view that the river of Vincent Pinzon was the old northern branch of the Araguari.

The Degree Measurement in Ecuador.—An account of the operations carried out during the first season by the French expedition for the re-measurement of an arc of the meridian in Ecuador was lately communicated to the Paris Geographical Society by M. Bourgeois, head of the survey party, whose paper is printed in *La Géographie* (vol. v. p. 340). The mission reached Guayaquil in June of last year, and the difficult task then commenced of transporting the whole impedimenta of the expedition, weighing in all some ten tons, by the primitive mule-paths which still form, for the greater part of the distance, the only means of communication between the coast and the elevated "Inter-Andine" region, in which the operations were to be carried on. Here the first place visited was Riobamba, where, during a stay of three months, the primary work of measuring a base-line and carrying out determinations of latitude, longitude, and azimuth was satisfactorily accomplished. The base-line chosen measured some 6 miles, and such was the precision with which the measurement was effected that the two separate results differed only by 7 mm., or a quarter of an inch. When this had been done, the expedition divided, one part continuing the triangulation in the neighbourhood of Riobamba, while the other measured a subsidiary base north of Quito, and determined the latitude of the northern extremity of the arc; the same being done for the southern extremity by an officer despatched for that purpose to Peru. During the stay at Tulcan, the northern station on the Columbian frontier, violent earthquake shocks were experienced, the whole region having been the scene of more than ordinary manifestations of volcanic activity during the last year. Eruptions both of Cotocachi, which had been regarded as extinct, and of Cumbal, in the Colombian territory, were observed. Although nominally Catholics, the Indians of the Inter-Andine region are very superstitious, and viewed the operations of the mission with great distrust, which they even manifested by acts of vandalism. During M. Bourgeois's absence the operations have been actively prosecuted under the direction of Captain Maurain.

AUSTRALASIA.

Dutch Expedition to the South Coast of New Guinea.—We learn from *Petermanns Mitteilungen* (1902, p. 119) that during a recent cruise along the southern coast of Dutch New Guinea for the purpose of inflicting punishment on native raiders, Assistant-Resident J. A. Kroesen visited the little-known portion of the coast on which Dr. Montague spent some time in captivity ten or more years ago. Some account of Dr. Montague's experiences was given in *Petermanns Mitteilungen* for 1892, but some doubt has since been cast on the accuracy of his statements. Mr. Kroesen's voyage has, however, in the main proved the correctness of Dr. Montague's account, both as regards the position of the villages and streams, and the conditions prevailing among the inhabitants.

POLAR REGIONS.

Return of the Baldwin Expedition.—This expedition has returned to Norway unsuccessful as regards an advance to the far north during the present year, but without having abandoned the hope of greater success on a second attempt. According to the details made public by Mr. Baldwin through Reuter's agency, the blocking of the Franz Josef Land channels by ice through the autumn of 1901 prevented the establishment of the intended depôts of provisions before the end of last year. This year three large depôts have been formed—one on Rudolf Land, near the headquarters of the Duke of the Abruzzi; a second in 81° 33′; and a third near the 81st parallel at Kane Lodge on the newly charted Greely island. The severe work told upon the sledges, while the food for the ponies and dogs, as well as the reserve supply of coal, had been depleted. Marine collections have been made, and photographs, including moving pictures of arctic life, taken. Nansen's hut was visited and sketched, and the record left by him secured.

The Plant Associations of the Arctic.—A very useful critical summary of publications on recent contributions to the ecology of the arctic regions is published in the *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zurich*, 46, 1901, from the pen of M. Rikli. He points out that the term "tundra" is applied by geographers to the regions north of the temperate forest limit, but by botanists to what Warming has termed the "fjeld" formation or association of plants, the most important and widely distributed on the geographical tundra, one also found in the higher mountain regions outside the polar circles. (1) This fjeld association of plants is characterized by dwarf xerophilic plants, of which mosses and lichens are the commonest. A few species, or even one, may be found predominating over considerable areas, but they do not completely cover the ground. This is also characteristic of the steppes, which are remarkable for great heat during the period of growth, whereas in the tundra excess of light is the most marked peculiarity of this period. Of the sub-associations we may distinguish (*a*) moss-fjeld, with species of (i.) polytrichum, or (ii.) dicranum predominating; and (*b*) the lichen-fjeld, with (i.) reindeer-moss (*Cladonia rangiferina*), (ii.) *Platysma-Cetraria*, (iii.) *Alectoria*, and (iv.) *Lecanora tartarea* prevailing as the conditions become more and more unfavourable. Lecanora is indifferent to rigorous climate or to the physical or chemical conditions of the ground, and hence is found at the plant limit, or forms the pioneer form on newly bared land. (*c*) The stony-fjeld is also a pioneer among the sub-associations, with mosses and a few rock-plants, such as saxifrages, curlew berry (*Empetrum*), *Papaver nudicaule*, etc. (*d*) The *Empetrum* sub-association is almost as hardy as the Lecanora one, and forms a transition to (2) the dwarf bush, which is rarely over 6 inches high, usually evergreen, with small compact leaves. *Empetra*, ericas, and vaccineas are the chief plants, but dwarf willows, birches (*Betula nana*), and in the south junipers (*Juniperus nana*) are found. (3) In the depressions are bog associations, which are of two groups, (*a*) grass, and (*b*) moss, according as one or the other type of plant predominates. (4) Locally some grassy meadows are found on the flood-plains in the larger valleys, and to these is due the name of Greenland. (5) On the gentle valley slopes facing the sun, the warm oases of the arctic, many species of perennial flowering plants are found; 40 to 60 species may be recognized on one patch, *i.e.* nearly one-tenth of the total arctic species. Very often these flowers may be found brightly colouring the slopes inside a fjord, around whose mouth, where fogs prevail, the snow still lies. (6) The littoral association is decidedly halophyllic, with succulent forms possessing long and much-branched roots or rhizomes. (7) Here and there, where human encampments or bird settlements have been formed, the accumulation of manure has favoured the growth of *Cochlearia* and arctic crucifers. Again, near the Greenland settlements, an adventitious flora is found of goose-grass, *Vicia Cracca*, *Stellaria media*, and other plants, due to the presence of man. (8) In the intermediate zone, between the fjeld-associations and the temperate forest, are pioneer woodlands of larch and birch. An instructive generalized section, illustrating the sequence of these associations and sub-associations, is appended to the article.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

A Sixteenth-century Map of the World on the Equidistant Polar Projection.—Mr. W. M. Voynich, in a supplement to his 'Exhibition Catalogue,' publishes the facsimile of a fragment of a manuscript map of the world, which he discovered in the original binding of a book printed in Italy in 1536. In an accompanying note Mr. E. G. Ravenstein discusses the age and character of the map, questions not readily determined, as the manuscript only includes parts of Europe, Eastern Asia, and Africa, and has moreover suffered greatly at the hands of the bookbinder. The fragment is part of a map of the world in two polar hemispheres, of a diameter of 356 mm. each. The outlines of the Mediterranean, of the Pontus, the Caspium Mare, the Mare Arabicum, and Sinus Persicus are taken from Ptolemy, but the nomenclature, although in Latin, is for the most part modern. Mr. Ravenstein suggests the author to have been a Spaniard, on the sole ground that he refers to the King of Ethiopia as "Preste Ivan." Its age is the sixteenth century, for the dynasty of the Safi, which arose in 1502, is referred to as reigning in Persia, whilst the nomenclature along the coast of Africa and in the Persian gulf is derived from Portuguese charts, such as were in the hands of the illustrators of the Strassburg Ptolemy of 1513. The empty space between the two hemispheres is occupied by the following legend: "Vitoria—Haec est sola navis quæ ad his polum pvenit mense septenbri anno natali xpr. vi die 1522 que quidem omnem vincit antiquitatem si quidem e columnis erculeis p. fortun. . . ." The outlines of a ship are faintly visible. In fine, Mr. Ravenstein is of opinion that these polar hemispheres were drawn in Spain, and immediately after the return of the *Victoria*, and if this be so they are the earliest known example of the employment of the Equidistant Polar Projection, hitherto believed to have been introduced for the first time by Mercator in a small inset of his famous chart of 1569. Mercator's little map, however, includes little more than the arctic region. The first map of the world on this projection was published in 1581, and is by Guillaume Postel.

The Normal Profile of Streams.—In a paper,* read before the Institute of Engineers and Architects in Vienna, Baurath Richard Siedek develops the idea of a "natural standard profile" of running streams. The practical end in view is to lay down precise conditions for systems of regulation applicable to large rivers of slight slope, such as form the great inland highways of commerce. Employing the formulæ obtained for the rate of current in rivers and streams (see this *Journal*, November, 1901, and January, 1902), Siedek follows a method similar to that adopted by S. Finsterwalder in dealing with the theory of the movement of glacier ice; corresponding to Finsterwalder's conception of a "stationary glacier with steady stream." His discussion is based on a "natural standard" or "normal" stream (*natürlichen Ideal oder Normalgewässer*). The line of the current in a river is made up of a series of curves, produced by the complex forces determining its direction, but in the "normal" stream the river bed is supposed to consist of perfectly homogeneous plastic material, and the current flows directly down the slope, under the action of gravity, in a straight line. These conditions are realized when the forces producing curvature neutralize one another, *i.e.* at points of inflection, which are also points of least depth, or "fords." Since the velocity, and with it the erosive power, of a stream increases with the quantity of water, the transporting movement increases in the curved portions when the water rises; and since the mass of water, and consequently the velocity, is least at the "fords," the transported material is there deposited. With a falling stream, on the other hand, the velocity at the "fords" is greatest, because the water has the steepest relative fall, and the "fords" are deepened. This agrees with universal experience. At the so-called "good fords," where the water flows in a straight line, the erosive action of the stream at low water is the greatest in the river, and at such places the "normal" profile develops, as it were, automatically. Thus at low water the natural "normal profile" affords a measure of the navigability of a river, and also of its maximum capacity for deepening its own channel. It is, in fact, the fundamental fact in relation to regulation. The relation between surface width, mean depth, slope, and current velocity can be computed for the "normal profile" from data obtained at the beginning of a "good ford." Calculations made on the Danube and the Elbe show quite remarkable agreement; the profiles are always symmetrical bows, whose axes coincide with the direction of the current, and whose vertical height rarely exceeds 2 to 4 per cent. of the breadth.

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* Published in the *Zeitschrift des oesterreichischen Ingenieur- und Architekten-Vereins* 1902, No. 8.

Nieve Penitente.—An abstract of a paper on the "nieve penitente" of South America, lately contributed by Dr. R. Hauthal to a scientific periodical at Buenos Aires, is given in a recent number of *Globus* (1902, p. 308). The author considers that, however unlikely such a view may seem, the true "nieve penitente" (*Büsserschnee* in German) is limited to South America, none of the accounts of its occurrence in other parts of the world having to do, in his opinion, with an exactly similar phenomenon. After quoting Dr. Güssfeldt's description of "nieve penitente" as the best yet written, and supplementing it from his own observation, Dr. Hauthal points out that the peculiarity of the phenomenon consists in the strangeness and infinite variety of form of the individual figures, coupled with the regularity with which these are arranged in parallel rows, though never united into continuous ridges. The shapes are never cylindrical or those of pillars, nor even conical, but rather pyramidal, often elongated in section in the direction of the rows. It is incorrect to give the name "snow" to the phenomenon, though the ice is originally formed from snow which has been consolidated by melting and renewed freezing; and, unlike glacier-ice, the structure is never granular. There is, however, an alternation of layers of homogeneous transparent ice with others of whitish opaque ice containing air-balls. The "nieve penitente," which is found only on easterly mountain slopes between the heights of 11,500 and 16,500 feet, seems to owe its origin to the differential action of the sun's rays on ice-fields according to the angle of incidence.

OBITUARY.

Sir Edward Hertslet.

OUR Society has lost an old and distinguished member in the person of Sir Edward Hertslet, who died from the effects of an operation on August 4, at the age of 78 years. Coming of a family which had long been associated with the Foreign Office, Sir Edward's whole career was likewise passed in its service, he having first obtained employment in the librarian's department so far back as 1840, while, after promotion to the post of sub-librarian in 1855, he succeeded his father as Librarian and Keeper of the Archives in 1857. During his long tenure of this important office he displayed great zeal in the study and utilization for the public service of the records committed to his charge, and to students of political geography he has been an especial benefactor by his indispensable collections of treaties referring to territorial boundaries both in Europe and Africa. In addition to these, he published a series of volumes dealing with the commercial treaties between this country and other nations, while a work of a more popular character appeared quite recently from his pen under the title 'Recollections of the old Foreign Office.' His 'Map of Europe by Treaty' and his 'Map of Africa by Treaty' are indispensable as works of reference. Sir Edward Hertslet's great knowledge of the history of diplomacy was requisitioned in his country's service in 1878, when he accompanied Lords Beaconsfield and Salisbury to the Berlin Congress in a special capacity; while in 1889 he served on the Commission appointed to regulate the boundary between the Dutch and British possessions in Borneo. He had been a Fellow of our Society since 1858.

Colonel C. R. Macgregor.

We regret to announce the death, which occurred in this country towards the end of last July, of Colonel C. R. Macgregor, C.B., D.S.O. Colonel Macgregor, who was only 53 years of age, had seen much active service on the frontiers of our Indian Empire. Born on October 22, 1848, he entered the army early in 1868, and four years later was appointed to a post in the Indian Staff Corps. After taking part in several punitive expeditions against the wild tribesmen of the north-east frontier, he was allocated for duty under Lord (then Sir Frederick) Roberts, and took part in the march to Kandahar. Subsequently he again served on the north-east frontier, and passed through various campaigns, including the last Burma campaign. For the last two years he has been acting Brigadier-General on the North-Eastern Frontier District.

The numerous campaigns in which Colonel Macgregor took part led him into many countries of which our knowledge was very slight, and that he was not indifferent to the geographical side of his work is shown by the fact that he not only became a Fellow of the Royal Geographical Society in 1881, but in 1886, read a paper before the Society descriptive of a journey from Sadiya, on the upper waters of the Brahmaputra, to the Kampti Shan country, on the western branch of the Irawadi. This journey he performed in company with the late General Woodthorpe, R.E., who did so much to increase our knowledge of the geography of Central Asia. The travellers ascended the Noa Dihing valley to the Chaukan pass (8400 feet), over which they crossed into the country drained by the Irawadi. After reaching the villages of the Bor Kamptis on the Mili-Kha, the party returned by one of the tributaries of the Kyerug-dwen, and crossed back into Assam over the Patkoi range. The Kampti Shan country had been previously visited from Sadiya in 1826, by Lieuts. Wilcox and Burlton, but Woodthorpe and Macgregor obtained much interesting information, and their party carried out a useful survey. Those who enjoyed the personal acquaintance of Colonel Macgregor have the pleasantest recollections of their intercourse with him. With the natives his influence was great, and altogether our Indian Empire sustains a heavy loss by his death.

Mr. Alexander Michie.

By the death of Mr. Alexander Michie, which took place on August 8, the Society loses one of its oldest members. Mr. Michie was born at Earlsferry, Fifeshire, in 1833. Having entered upon a commercial career in the Far East, he rendered valuable services to Admiral Sir James Hope during the Tai-ping rebellion. In 1863 he returned to Europe by way of Siberia, and from that year dates his connection with the Society. He became a Fellow of the Society, and contributed to the old *Journal* a paper describing a journey from Tientsin to Mukden. The following year he published a full account of his journey home, which, in the then state of geographical knowledge, excited much interest. Returning to China, Mr. Michie became chairman of the Chamber of Commerce at Shanghai, and on behalf of that body he and Consul Swinhoe conducted a mission into Western China, which resulted in the collection of much valuable information, particularly as regards the province of Szu-chuan. In later years, Mr. Michie acted as correspondent for the *Times*. He settled down in this country in 1895, and the work which he subsequently gave to the world, under the title of 'An Englishman in China,' is valuable as containing the matured judgment on the modern relations between East and West of one who had lived in the Celestial Empire for over forty years.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Is. = Isvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Austria—Lake of Gmunden. **Liburnau.**
M.K.K.G. Ges. Wien **45** (1902): 55-83, 107-131.
Materialien zu einer Morphogenie der Schotterhügel und Terrassen am Nordende des Gmundener Sees. Eine Localstudie von Dr. J. R. Ritter Lorenz v. Liburnau.

Austria-Hungary. *Questions Dipl. et Colon.* **14** (1902): 69-89. **Jaray.**
Les nationalités en Autriche-Hongrie. Par Gabriel Louis Jaray. *With Map.*

Austria-Hungary—Galicia. *Vierteljahrs. G. Unterricht.* 1 (1902): 263-268. **Juritsch.**
Die polnische Tatra. Von Director Dr. Georg Juritsch.

Belgium—Population. *Mouvement G.* **19** (1902): 347-349. ———
La population de la Belgique.

France. *Vierteljahrs. G. Unterricht* 1 (1902): 193-203. **Müller.**
Ueber die Verwertung gewisser Gesetzmässigkeiten in der Umriss und der Bodengestalt europäischer Lander in der Chorographie. Von Prof. Dr. Johannes Müller. *With Map.*

France—Auvergne. *Rev. Scientifique* **18** (1902): 65-71. **Bruyant.**
Les Lacs d'Auvergne et l'Aquiculture. Par C. Bruyant.

France—Beaujolais. **Privat-Deschanel.**
Introduction à l'étude géographique du Beaujolais Tectonique et géologie. Par Paul Privat-Deschanel. (Mém. Soc. Fribourgeoise Sciences Naturelles. II. Fasc. 3. Géologie et Géographie.) *Maps and Diagrams.*

France—Canal. *B.S.G. Lille* **37** (1902): 335-359. **Palmié.**
Le canal des Deux Mers. Son intérêt au double point de vue économique et national, la possibilité de son exécution. Par M. Edmond Palmié. *With Illustrations.*

France—Marne. *C. Rd.* **134** (1902): 1455-1457. **Martel.**
Sur la rivière souterraine de Trépail (Marne). Note de M. E.-A. Martel.

France and Switzerland. *Rev. G.* 50 (1902): 441-445. ——

Les grandes lignes de circulation du Globe. Le percement de la Faucille. Par Ct. M.

On the project for the connection of the Simplon railway with French lines by a tunnel through the Jura.

Germany. *Abh. K.P.A.W., Berlin* (1901): 1-169. **Branco and Fraas.**

Das vulcanische Ries bei Nördlingen in seiner Bedeutung für Fragen der allgemeinen Geologie. Von H. H. W. Branco und Prof. Dr. E. Fraas. *With Map and Sections.*

The authors regard the morphological features of the Ries, which have puzzled so many observers, as the result of the formation of a laccolith, involving an extension of Gilbert's theory as to such phenomena. Their views have, however, been challenged (cf. *Journal*, vol. xviii. p. 321).

Germany. *Deutsch. Rundschau G.* 24 (1902): 348-358. **Bruhns.**

Ueber die vorgeschichtliche Bevölkerung auf deutschen Boden. Von Dr. B. Bruhns.

Germany—Baden. **Neumann.**

Land und Leute. Monographien zur Erdkunde, herausgegeben von A. Scobel, xiii. Der Schwarzwald. Von Prof. Dr. Ludwig Neumann. Bielefeld and Leipzig: Velhagen & Klasing, 1902. Size 10½ × 7, pp. 168. *Map and Illustrations. Price* 4*s*.

An attractive work, giving a clear account of the Black Forest both in its physical and human relations.

Germany—Canal. **Hermann.**

Internat. Engineering Congress, Glasgow, 1901. *P. Sect. II.* (1902): 2-23.

The Dortmund and Ems Canal. By Herr Regierungs- und Baurath-Hermann. *Diagram and Illustrations.*

Germany—Dunes. **Gerhardt.**

Handbuch des deutschen Dünenbaues. Im Auftrage des Kgl. Preuss. Ministeriums der öffentlichen Arbeiten und unter Mitwirkung von Dr. Johannes Abromeit, Paul Bock, Dr. Alfred Jentzsch, herausgegeben von Paul Gerhardt. Berlin: Paul Parey, 1900. Size 9 × 6, pp. xxviii. and 656. *Maps and Illustrations. Presented by Dr. A. Zimmermann.*

A very thorough piece of work, dealing principally with the methods employed in the many for fixing the dunes by planting, etc., but opening with a useful sketch of Gerphysical history and structure of dunes in general.

Germany—Prussia—Railways. **Collier.**

Prussian Railways. Foreign Office, Miscellaneous, No. 574, 1902. Size 9½ × 6, pp. 56. *Price* 3*d*.

Germany—Prussian Saxony. **Hellmann.**

Regenkarte der Provinz Sachsen und der Thüringischen Staaten, mit erläuterndem Text und Tabellen. In amtlichem Auftrage bearbeitet von Prof. Dr. G. Hellmann. Berlin: Dietrich Reimer (Ernst Vohsen), 1902. Size 10½ × 7, pp. 32. *Map.*

Germany—Thuringia. *Naturw. Wochenschrift* 1 (1902): 170-176, 433-440. **Scheibe.**

Geologische Spaziergänge im Thüringer Wald. Von Dr. R. Scheibe. *With profiles, etc.*

Germany—Trade. **Ward.**

Trade of Consular District of Hamburg for the year 1901. Foreign Office, Annual No. 2821, June, 1902. Size 9½ × 6, pp. 94. *Price* 5*d*.

Greece—Mineral Resources. **Bennett.**

Mineral Resources of Greece. Foreign Office, Miscellaneous, No. 576, 1902. Size 9½ × 6, pp. 24. *Maps. Price* 10½*d*.

The writer considers that the development of the mining industry of Greece, which has already made some progress, merits increased attention, and should supply a good opening for the employment of capital.

Greece and Crete. *C. Rd.* 134 (1902): 1157-1159. **Cayeux.**

Sur les rapports tectoniques entre la Grèce et la Crète occidentale. Note de M. L. Cayeux.

The author was one of the members of the French expedition to Crete in 1901 (cf. *Journal*, vol. xix. p. 212).

Hungary—Tatra. *Jahrb. Ungar. Karpathen-V.* 29 (1902): 53–114. **Dénes.**

Die Geologie des Tátragebirges. Auszug aus Prof. Dr. V. Uhlig's Werke. Von Prof. Franz Dénes. *With Profiles.*

Iceland. *G. Tidskrift* 16 (1901–1902): 155–173. **Bruun.**

Ved Vatna Jökulls Nordrand. Undersøgelser foretagne i Sommeren, 1901, paa Islands Østland. Af Kaptain Daniel Bruun. *With Map and Illustrations.*

Italy. **Nissen.**

Italische Landeskunde. Von Heinrich Nissen. Zweiter Band: Die Staedte. Erste Haelfte. Berlin: Weidmannsche Buchhandlung, 1902. Size 9 × 6, pp. iv. and 480. *Price 7s.*

The first volume of this work, which appeared as far back as 1883 (*Proc. R.G.S.*, 1884, p. 169), dealt with the physical features of Italy from the point of view of historical geography. The present instalment treats of the separate provinces in turn with reference to their inhabitants and the development of the towns and settlements, a historical standpoint being still maintained.

Lake of Geneva. *C. Rd.* 134 (1902): 1319–1321. **Yung.**

Des variations quantitatives du plankton dans le lac Léman. Note de M. Émile Yung.

Montenegro, etc. **Avelot and De la Nézière.**

H. Avelot et J. De la Nézière. Montenégro, Bosnie, Herzégovine. Paris: Henri Laurens, [not dated]. Size 10½ × 7½, pp. 248. *Illustrations. Presented by M. J. De la Nézière.*

Popular notes of travel, profusely illustrated by the author's sketches.

Norway—Lofoten Islands. *Alpine J.* 21 (1902): 90–102. **Collie.**

The Lofoten Islands. By J. Norman Collie. *With Illustrations.*

Rumania. *Rev. Française* 27 (1902): 211–223. **Paquier.**

La Roumanie économique: La question du pétrole. Par Léon Paquier. *With Map.*

Russia—Finland—Geodesy. *Fennia* 10, No. 1 (1894–1901): 1–61. **Järnefelt.**

Astronomo-geodeettiset työt Suomessa vuosina 1865–1875. Kirjoittanut A. Järnefelt. Suomensi Otto Savander.

Sweden. ———

Svenska Turistföreningens Årsskrift för år 1902. Stockholm: Wahlström & Widstrand. *Illustrations.*

Contains descriptive articles by various writers.

weden—Gotland. *Tour du Monde* 8 (1902): 109–120. **Maury.**

L'ile de Gotland et les représentations théatrales de Visby. Par M. Lucien Maury. *With Illustrations.*

United Kingdom—Dorsetshire. *Geolog. Mag.* 9 (1902): 241–256 **Hudleston.**

Creechbarrow in Purbeck. By W. H. Hudleston, F.R.S. *With Illustrations.*

United Kingdom—Lake District. **Collingwood and others.**

The Lake Counties. By W. G. Collingwood. With special articles on birds, butterflies and moths, flora, geology, fox-hunting, mountaineering, yachting, angling, shooting, and cycling, by Miss Armitt, Canon Crewdson, Mr. Petty, Prof. Hull, etc. London: J. M. Dent & Co., 1902. Size 6½ × 4, pp. xii. and 392. *Maps and Illustrations. Price 4s. 6d. net. Presented by the Publishers.*

The object of this dainty little book differs from that of ordinary guide-books, which it will supplement without supplanting. In place of the usual, and in their way indispensable, practical directions to enable the tourist to find his way from place to place, it presents rather a series of pictures displaying the inner life, as it were, of the Lake country, and the associations and characteristics to which it owes its unique hold on the affections of its admirers. The author writes with the full sympathy with his subject which can alone give success in such a task, and the special articles treat concisely yet clearly of their several subjects.

United Kingdom—London. **Baedeker.**

London and its Environs. Handbook for Travellers. By Karl Baedeker. 13th Revised Edition, Leipsic: Karl Baedeker, 1902. Size 6½ × 4½, pp. x. and 450.

Maps and Plans. Price 6 *m.* 2 *copies, one presented by the Editor, the other by Messrs. Dulau & Co.*

United Kingdom—London. *G. Teacher* 1 (1902): 67–76. **Davies.**

The Geography of Greater London. By A. M. Davies, B.SC. *With Maps.*

United Kingdom—Mersey. **Nares.**

Report on the Present State of the Navigation of the River Mersey (1901), to the Right Honourable the Commissioners for the Conservancy of the River Mersey. By Vice-Admiral Sir G. S. Nares, K.C.B., F.R.S. London: Printed by Darling & Son, 1902. Size 10 × 6½, pp. 30. *Presented by the Mersey Conservancy.*

United Kingdom—Scotland—Clyde. **Alston.**

Internat. Engineering Congress, Glasgow, 1901. *P. Sect. II.* (1902): 98–123.

The River Clyde and Harbour of Glasgow. By W. M. Alston. *Map and Diagr.*

United Kingdom—Scotland—Edinburgh. **Geddes.**

Scottish G. Mag. 18 (1902): 302–312.

Edinburgh and its Region, Geographic and Historical. By Prof. Patrick Geddes.

United Kingdom—Trade. **Cox.**

The United Kingdom and its Trade. By Harold Cox. (Harper's International Commerce Series.) London: Harper Bros., 1902. Size 8 × 5½, pp. xvi. and 158. *Map. Price* 3*s.* 6*d.*

United Kingdom—Wales. **Baddeley and Ward.**

Thorough Guide Series. North Wales (Part i.) By M. J. B. Baddeley and C. S. Ward. Seventh Edition, Revised. London: Dulau & Co., 1902. Size 6½ × 4½, pp. xxiv. and 238. *Maps, Plans, and Panoramas. Price* 3*s. net. Presented by the Publisher.*

United Kingdom—Wales—Historical. **Little.**

Mediæval Wales. Chiefly in the twelfth and thirteenth centuries. Six Popular Lectures by A. G. Little. London: T. Fisher Unwin, 1902. Size 7½ × 5, pp. xii. and 148. *Maps and Plans. Presented by the Publisher.*

A series of popular lectures on some famous Welshmen (including Giraldus Cambrensis), and on the old Welsh castles and religious houses.

ASIA.

China. **Cordier.**

Histoire des relations de la Chine avec les puissances occidentales 1860–1902. [Vol. iii.] L'Empereur Kouang-Siu (Deuxième partie, 1888–1902). Par Henri Cordier. Paris: Félix Alcan, 1902. Size 9 × 5½, pp. 598. *Map. Price* 10*fr.*

The present volume completes the work, bringing the record of events down to the present time. The author fears that the lessons of the past few years will be quickly forgotten by the Chinese.

China—Marco Polo's Travels. *Is. Imp. Russ. G. S.* 38 (1902): 1–46. **Veselovsk.**

Commentary by the archimandrite Palladius Kafaroff on the travels of Marco Polo in North China. N. T. Veselovsk. [In Russian.] *With Portrait.*

China—Newchwang. **Hosie.**

Trade of Newchwang for the year 1901. Foreign Office, Annual No. 2828, June, 1902. Size 9½ × 6, pp. 16. *Price* 1*d.*

Chinese Empire. *Iz. Imp. Russ. G.S.* 37 (1901): 355–483. **Potanin.**

Journey in the Central part of the Great Khingan in the Summer of 1899. By G. H. Potanin. [In Russian.] *With Map.*

Eastern Turkestan. *Globus* 81 (1902): 293–295, 320–323. **Winternitz.**

Dr. M. A. Steins Forschungen in Ostturkestan und deren wissenschaftliche Ergebnisse. Von Prof. Dr. M. Winternitz.

India—Bay of Bengal. ———

The Bay of Bengal Pilot, or Sailing Directions for the Coasts of Ceylon, India, and Siam, from Colombo to Junkseylon; the North-West Coast of Sumatra; and the Nicobar and Andaman Islands. Third Edition. London: Eyre & Spottiswood, 1901. Size 9½ × 6, pp. xxviii. and 508. *Chart. Price* 4*s.* 6*d. Presented by the Hydrographer, Admiralty.*

India—Trade. **Tozer.**

British India and its Trade. By H. J. Tozer. (Harper's International Commerce

Series.) London: Harper Bros., 1902. Size 8 × 5½, pp. xiv. and 90. *Map. Price 3s. 6d.*

Indian Ocean—Maldives and Laccadives. **Gardiner.**

The Fauna and Geography of the Maldive and Laccadive Archipelagoes. Being the Account of the Work carried on and of the Collections made by an Expedition during the years 1899 and 1900. Edited by J. Stanley Gardiner, M.A. Vol. i. Part ii. Cambridge: the University Press; London: C. J. Clay & Sons. 1902. Size 11½ × 9, pp. 119–222. *Charts and Illustrations. Price 15s. net.*

This part contains various zoological reports, together with the continuation of Mr. Gardiner's discussion of the coral formations of the Maldives and Laccadives and other parts of the Indian ocean.

Japan—Formosa. **Campbell.**

The Articles of Christian Instruction in Favorlang-Formosan, Dutch and English, from Vertrecht's Manuscript of 1650, with Psalmanazar's Dialogue between a Japanese and a Formosan and Happart's Favorlang Vocabulary. Edited by Rev. Wm. Campbell. London: Kegan Paul & Co., 1896. Size 9 × 7, pp. xx. and 200. *Presented by the Author.*

Japan—Formosa. *Z. Ges. Erdk. Berlin* (1902): 293–304. **Richthofen.**

Ueber eine Reise durch Formosa im Jahr 1900. Von W. Frhr. v. Richthofen. *With Illustrations.*

Malay Archipelago—Mentawei Islands. **Maas.**

Bei liebenswürdigen Wilden. Ein Beitrag zur Kenntnis der Mentawai-Insulaner, besonders der Eingeborenen von Si Oban auf Süd Pora oder tobo lagai. Nach Tagsbuch-Blättern von Alfred Maass. Berlin: W. Süsserott, 1902. Size 8½ × 6, pp. 256. *Maps and Illustrations. Price 7s. 6d.*

An account of the inhabitants of the little-known Mentawei group off the south-west coast of Sumatra, attention being paid both to their customs, industries, etc., and to their physical anthropology. A short account of the author's visit to the group was given in the *Journal* for 1898 (vol. xii. p. 410).

Northern Asia. *Zemlevedenie* (1902): 28–85. **Bielski.**

Northern Asia and its Geological Formations. By P. A. Bielski. [In Russian.] *With Maps.*

Pamir. *G. Tidskrift* 16 (1901–1902): 142–151. **Olufsen.**

Den anden danske Pamir expedition 1898–99. Rejse i Garan. Af O. Olufsen. *With Map and Illustrations.*

This concludes the series of articles which have appeared in the *Tidskrift* on Olufsen's second expedition.

Persia. *Iz. Imp. Russ. G.S.* 38 (1902): 47–108. **Rittikh.**

Journey in Persia and Persian Beluchistan in the year 1900. By P. A. Rittikh. [In Russian.] *With Maps.*

Persian Gulf. *J.S. Arts* 50 (1902): 634–652. **Bennett.**

The Past and Present Connection of England with the Persian Gulf. By T. J. Bennett.

Persian Gulf. **Kemball.**

Trade of the Persian Gulf for the year 1901. Foreign Office, Annual No. 2803, 1902. Size 9½ × 6, pp. 44. *Price 2½d.*

Philippine Islands. ———

Annual Reports of the War Department for the fiscal year ended June 30, 1901. Report of the Philippine Commission. 2 Parts (Part i. pp. 190), (Part ii. pp. 676). Public Laws and Resolutions passed by the Philippine Commission. (Pp. xviii. and 816.) Washington, 1901. Size 9 × 6. *Map and Plates.*

These volumes refer to a later period in the proceedings of the Commission than the report to the President of the United States previously noted in the *Journal.* Part i. is a general report on the work of the Commission and the present state of the Philippines, while Part ii. includes various reports on special subjects, *e.g.* one on Gutta-Percha and Rubber in the Malay Region.

Philippine Islands—Samar. *Ann. Hydrographie* 30 (1902): 120–126. ———

Die Insel Samar.

Russia—Baku. **Chambers.**
The Russian Petroleum Trade. Production of Crude Oil of the Baku Fields. (Consular Reports, June, 1902, vol. lxix. 175-216.) *Map.*

Russia—Caucasus. **Radde.**
Die Sammlungen des Kaukasischen Museums, im Vereine mit Special-Gelehrten bearbeitet, und herausgegeben von Dr. Gustav Radde. Band iii. Geologie. Von. Prof. N. I. Lebedew. Tiflis, 1901. Size 12½ × 9, pp. 322. *Map and Plates. Presented by Dr. G. Radde.*

Russia—Siberia. *Petermanns M.* **48** (1902): 78-83. **Sibiriakow.**
Der Weg von Jakutsk zum Ochotskischen Meer. Ajan, ein Seehafen für das Gebiet Jakutsk. Von Alex. Sibiriakow. *With Map.*

Russia—Siberia. **Meakin.**
A Ribbon of Iron. By Annette M. B. Meakin. Westminster: A. Constable & Co., 1901. Size 8 × 5, pp. 320. *Map and Illustrations. Presented by the Publisher.*

Account of a journey by two English ladies across Siberia in 1900.

Russian Central Asia. **Lipsky.**
Upper Bukhara, Results of three years' travels in Central Asia in 1896, 1897, and 1899. V. I. Lipsky. Part i. [In Russian.] St. Petersburg, 1902. Size 11½ × 9, pp. 318. *Illustrations.*

Sea of Aral. *Iz. Imp. Russ. G.S.* **38** (1902): 109-120. **Berg.**
Hydrological Explorations in the Sea of Aral in the summer of 1901. By L. Berg. [In Russian.]

Turkestan. **Schwarz.**
Turkestan, die Wiege der indogermanischen Völker. Nach funfzehnjährigem Aufenthalt in Turkestan dargestellt von Franz v. Schwarz. Freiburg: B. Herder, 1900. Size 9½ × 6½, pp. xx. and 606. *Map and Illustrations. Price* 13*m. Presented by the Publisher.*

The author, who has lived fifteen years in Turkestan, and was formerly astronomer at the Tashkent Observatory and Director of the Turkestan Meteorological Institute, gives in this work a valuable account of the people of that country, their origin, manners, and customs, industries, trade and agriculture, etc. The concluding section is devoted to the climate, and the book contains a small map and an excellent index.

Turkey—Mitilini. *B.S.R.G. d'Anvers* **26** (1902): 49-84. **Hauttecœur.**
L'île de Mytilini. Par M. H. Hauttecœur.

Turkey—Palestine and Syria. *Globus* **81** (1902): 309-314. **Nehring.**
Die geographische Verbreitung der Säugetiere in Palästina und Syrien. Von Prof. Dr. A. Nehring. *With Map.*

AFRICA.

Abyssinia. *B.S.G. Italiana* **3** (1902): 539-544. **Erlanger.**
Sulla spedizione e relativo soggiorno in Abissinia e nei paesi dei Galla e dei Somali. Relazione del barone carlo von Erlanger. *With Map and Illustration.*

See note in the Monthly Record.

Abyssinia. *Beiträge Kolonialpolitik* **3** (1901-1902): 610-615. **Hermann.**
Abessiniens Grenzen. Von Dr. Rudolf A. Hermann.

Africa. *P.R.I.* **16** (1902): 532-546. **Gibbons.**
Through the Heart of Africa from South to North. By Major Alfred St. Hill Gibbons.

Africa—Cartography. *Die Natur* **51** (1902): 16-17, 28-29, 68-69. **Behrens.**
Kartenaufnahmen in Afrika. Von Heinrich Behrens.

Angola. *Scottish G. Mag.* **18** (1902): 358-369. **Lewis.**
Life and Travel among the People of the Congo. By Rev. Thomas Lewis.

British East Africa. *J.S. Arts* **50** (1902): 684-690. **Betton.**
Prospective Railway Developments in British Equatorial Africa. By C. Steuart Betton. *With Map.*

On the advisability of constructing a railway from Entebbe, in Uganda, down the Nile valley to Gondokoro.

British East Africa. **Lyne.**

Agricultural Prospects of the Plateaux of the Uganda Railway. Foreign Office, Miscellaneous, No. 577, 1902. Size 9½ × 6½, pp. 12. *Price* 1*d.*

This is noticed in the Monthly Record.

Cape Colony. **Gilchrist.**

Cape of Good Hope. Department of Agriculture. Marine Investigations in South Africa. Observations on the Temperature and Salinity of the Sea around the Cape Peninsula. By J. D. F. Gilchrist. Cape Town, 1902. Size 9½ × 6½, pp. 181-216. *Diagrams. Presented by the Author.*

This will be specially noticed.

Cape Colony. ——

Report of His Majesty's Astronomer at the Cape of Good Hope to the Secretary of the Admiralty for the year 1901. London, 1902. Size 12 × 10, pp. 22.

This will be noticed in the Monthly Record.

Cape Colony—Saldanha Bay. **Stevens.**

Saldanha Bay and its Development. By D. C. Stevens. (Cutting from the *Cape Argus Weekly Edition*, November 13, 1901.)

Central Africa. *B.S. d'Études Colon.* 9 (1902): 277-301. **Hecq.**

Les grands lacs africains et le Manyema. Par C. Hecq. *With Illustrations.*

On a journey from the mouth of the Zambezi to Lake Kivu and Manyema.

Central Africa—Nyasa-Tanganyika Boundary.

Treaty Series. No. 8, 1902. Agreement between the United Kingdom and Germany relative to the Boundary of the British and German Spheres of Interest between Lakes Nyasa and Tanganyika. Signed at Berlin, February 23, 1901. London: Eyre and Spottiswoode, 1902. Size 9½ × 6, pp. 6. *Map. Price* 6½*d.*

This agreement ratified the recommendations of the Anglo-German boundary commission with regard to the boundary-line, which have already been alluded to in the *Journal* (vol. xviii. p. 430).

Congo. *T. and* 10*th Rep. Liverpool G.S.* (1901): 23-29. **Lemaire.**

The Sources of the Congo. By Captain Charles Lemaire. *With Map.*

Discusses the question as to the branch which ought to be considered the head-stream of the Congo. The author considers Delcommune's statement that the Luapula brings down more water than the Lualaba to be based on insufficient evidence.

Congo State. *Mouvement G.* 19 (1902): 295-296. ——

La population des rives du Congo (Lualaba) entre Ponthierville (en amont des Stanley-Falls) et Kasingi (en aval des chutes de Hinde).

Egyptian Sudan. *Naturw. Wochenschrift* 1 (1902): 373-378. **Linck.**

Die Hochebene Kordofans, ein Zug im Antlitz der Erde. Von G. Linck. *With Map and Illustrations.*

Egyptian Sudan—Railways. **Macauley.**

Internat. Engineering Congress, Glasgow, 1901. *P. Sect. I. Railways* (1902) 33-45. The Sudan Government Military Railways. By Major C. B. Macauley. *With Map.*

Fernando Po. *Kolon. Z.* 3 (1902): 139-140. ——

Fernando Poo. *With Map.*

French Congo. *B.S.G. Marseille* 25 (1901): 242-266. **Léotard.**

Sur la route de Fachoda. De l'Atlantique au Bahr-el-Ghazal en cinq mois. L'Enseigne de Vaisseau André Perrot. Par M. Jacques Léotard.

On the journey of a young naval officer who was assassinated in the Bahr-el-Ghazal in 1899 while on his way from the Congo towards Fashoda.

French Congo. *B.S.G. Lyon* 17 (1902): 734-740. **Trilles.**

Mille lieues dans l'Inconnu (De la Côte de Guinée aux Rives de la Sangha, à travers le Pays Pfang). Par le R. P. Trilles.

The author accompanied M. Lesieur in his expedition across the northern part of French Congo (*Journal*, vol. xviii. p. 535).

French West Africa. **Gentil.**
Emile Gentil. La chute de l'Empire de Rabah. Paris: Hachette et Cie., 1902. Size 10 × 6½, pp. 308. *Map and Illustrations. Presented by the Publishers.*

This will be specially reviewed.

French West Africa. *Rev. Française* **27** (1902): 193-207. **Montell.**
L'organisation du Bas Chari. La colonne Destenave et la mort de Fad el Allah. Par A. Montell. *With Map.*

German Colonies—River-navigation. *B.S. d'Études Colon.* **9** (1902): 353-359. ——
La navigabilité des Cours d'eau dans les Colonies Allemandes d'Afrique.

German East Africa. *Sitz. A.W. Berlin* (1902): 215-236. **Engler.**
Ueber die Vegetationsverhältnisse des im Norden des Nyassa-Sees gelegenen Gebirgslands. Ergebniss der Nyassasee- und Kingagebirgs-Expedition der Hermann und Elise geb. Heckmann Wentzel-Stiftung. Von A. Engler.

This is noticed at p. 338, *ante*.

German East Africa. **Merker.**
Rechtsverhältnisse und Sitten der Wadschagga. Von M. Merker. (*Dr. A. Petermanns Mitteilungen*, Ergänzungsheft Nr. 138.) Gotha: Justus Perthes, 1902. Size 11 × 7½, pp. 42. *Illustrations. Price* 4*m.*

German South-West Africa. *Z. Ges. Erdk. Berlin* (1902): 215-230. **Hartmann.**
Das Ambo-Land auf Grund seiner letzten Reise im Jahr 1901. Von Dr. Georg Hartmann. *With Map and Illustrations.*

Kamerun. *Petermanns M.* **48** (1902): 73-78. **Langhans.**
Vergessene Reisen in Kamerun. I.—Reisen des Missionars Alexander Ross von Alt-Kalabar nach Efut 1877 und 1878. Von Paul Langhans. *With Map.*

Liberia—Frontier. *Rev. G.* **50** (1902): 517-520. ——
La frontière franco-libérienne. Par A. N. *With Maps.*

Madagascar. **Brandstetter.**
Malayo-Polynesische Forschungen von Prof. Dr. Renward Brandstetter. Zweite Reihe. II.—Tagalen und Madagassen. Eine sprachvergleichende Darstellung als Orientierung für Ethnographen und Sprachforscher. Luzern: J. Eisenring, 1902. Size 9 × 6½, pp. 86.

A detailed comparison of the Tagal Language of the Philippines with Malagasy.

Madagascar. *B.S.G. Marseille* **25** (1901): 229-241. **Carré.**
Les Ports de la Côte ouest de Madagascar. Par M. Pierre Carré.

Madagascar. *C. Rd.* **134** (1902): 958-961. **Colin.**
Travaux géographiques autour du massif Central de Madagascar. Par le P. Colin. *With Plan.*

On a survey by theodolite and astronomical observations.

Madagascar. *C. Rd.* **134** (1902): 1274-1278. **Colin.**
Travaux magnétiques autour du massif Central de Madagascar. Note du P. Colin. *With Diagram.*

Madagascar. *Rev. Maritime* **153** (1902): 1017-1036. **Fichot.**
Les côtes de Madagascar. Par E. Fichot. *With Map.*

Madagascar. *Rev. G.* **50** (1902): 424-440. ——
L'œuvre du général Galliéni à Madagascar. Par Capitaine P——.

Madagascar—Language. *Rev. Scientifique* **17** (1902): 801-807. **Mager.**
Les origines de la langue malgache. Par M. Henri Mager.

Morocco. **Canal.**
Géographie Générale du Maroc. Par Joseph Canal. Paris: A. Challamel, 1902. Size 12½ × 8½, pp. xiv. and 188. *Maps. Price* 6*s.*

This monograph received the prize lately offered by the Oran Geographical Society for a general geography of Morocco. It gives a clear outline of the geography (physical, political, and economic) based on the works of the principal travellers, and will be useful as bringing together a mass of scattered information on a country which must more and more attract the attention of Europe.

Morocco. *B.S.G. Marseille* **25** (1901): 411–416. **Delbrel.**

Le Maroc actuel et la Cour Obérifienne. Par M. G. Delbrel.

Morocco. *La G., B.S.G. Paris* **5** (1902): 321–339. **Weisgerber.**

Explorations au Maroc: I. L'Oum Er-Rebia; II. Les thermes des environs de Fas. Par Dr. F. Weisgerber. ***With Maps and Illustrations.***

Dr. Weisgerber's explorations have already been referred to in the *Journal* (vol. xix. pp. 88).

Natal. *J.R. Colonial I.* **33** (1902): 145–168. **McMaster.**

The High Plateaus of Natal, their Climate and Resources. By Emile McMaster, B.A.

Niger. *Renseignements Colon., Comité l'Afrique Française* No. 4 (1902): 73–79. **Lenfant.**

La navigabilité du Niger: rapport du Capitaine Lenfant. ***With Maps and Portrait.***

North-East Africa. *Scottish G. Mag.* **18** (1902): 281–302. **Austin.**

Through the Sudan to Mombasa *viâ* Lake Rudolf. By Major Austin, C.M.G. ***With Map.***

Rhodesia. *Rev. G.* **50** (1902): 340–348. **Maitre.**

Pénétration de la "North-Eastern Rhodesia," par les missionnaires français. Par Henri Maitre.

A sketch of the work of the "White Fathers" in North-Eastern Rhodesia, the geographical results of which are summarized in the present number of the *Journal.*

Sahara. *Rev. Française* **27** (1902): 278–288. **Demanche.**

La France et le Maroc à Figuig. Par G. Demanche. ***With Map.***

Sahara. *La G., B.S.G. Paris* **5** (1902): 5–20, 175–195. **Bruhnes.**

Les Oasis du Souf et du M'zab comme types d'établissements humains. Par Jean Bruhnes. ***With Map and Illustrations.***

South Africa—Geodetic Survey. **Gill.**

Cape of Good Hope. Geodetic Survey of South Africa. Vol. ii. Report on a Rediscussion of Bailey's and Fourcade's Surveys and their Reduction to the System of the Geodetic Survey. By Sir David Gill, K.C.B. Cape Town, 1901. Size 13 × 8, pp. xx. and 258. *Chart.*

Tripoli. *Rev. G.* **50** (1902): 281–293. **Dornin.**

La question de la Tripolitaine. Par Pierre Dornin. ***With Map.***

Uganda Protectorate. **Johnston.**

The Uganda Protectorate. An Attempt to give some description of the Physical Geography, Botany, Zoology, Anthropology, Languages, and History of the Territories under British Protection in East Central Africa, between the Congo Free State and the Rift-Valley, and between the 1st degree of S. Latitude and the 5th degree of N. Latitude. By Sir Harry Johnston. In two vols. London: Hutchinson & Co., 1902. Size 10 × 7, pp. xx. and 1018. ***Maps, Plates, and Illustrations. Price 42s. net. Presented by the Publishers at Author's request.***

This is reviewed in the present number.

Wadai. *Rev. G.* **50** (1902): 258–268. ———

Notes sur le Ouadaï.

Based on communications from Captain Robillot, one of the French officers entrusted with the pacification of the Shari region.

West Africa. *J. African S.* (1902): 288–301. **Jackson.**

The Vegetable Resources of West Africa. By John R. Jackson.

West Africa—Railways. *J. African S.* (1902): 339–354. **Shelford.**

On West African Railways. By Fred Shelford, B.SC. ***With Illustrations.***

NORTH AMERICA.

America—Railway. ———

Monthly B. Internat. Bureau American Republics **12** (1902): 1131–1148.

The Intercontinental Railway. *With Map.*

Report of the Committee to the Pan-American Congress of last year (cf. *Journal,* vol. xvii. p. 77).

Canada. ———

Annual Report of the Department of the Interior for the year 1900–1901. Ottawa,

1901. Size 10 × 6½, pp. xii., xlviii., 329, 29, 8, 8, 6, 39, and 16. *Maps and Illustrations.*

Includes Reports on Immigration, Forestry, etc., as well as a number of important reports on recent surveys (cf. *ante*, p. 340).

Canada. ———

Third Annual Report of the Geographic Board of Canada, 1901. (Supplement to the Thirty-Fourth Annual Report of the Department of Marine and Fisheries.) Ottawa, 1902. Size 10 × 6½, pp. 44.

Mainly a reprint of the last report (*Journal*, vol. xviii. p. 333).

Canada. **Baillairgé.**

Memoranda. Canada from the Atlantic to the Pacific and Arctic Oceans, Arctic Voyages, Voyages of Discovery in the North, and Public Works, etc., etc. By G. F. Baillairgé, Deputy Minister of Public Works. Size 10 × 6½, pp. 272. *Presented by the Author.*

Contains a considerable amount of miscellaneous information on Canadian geography and history.

Canada—Athabasca River. *Appalachia* 10 (1902): 28–43. **Habel.**

At the Western Sources of the Athabasca River. By Jean Habel. *With Plates.*

Canada—British Columbia. ———

Recent Gold Discoveries on Horsefly River, Cariboo District, B.C. Victoria, B.C., 1901. Size 11 × 7½, pp. 8. *Map.*

Canada—Geological Survey. ———

Summary Report of the Geological Survey Department for the Calendar Year 1901. Ottawa, 1902. Size 10 × 6½, pp. 270. *Plates.*

Canada—Mt. Assiniboine. *Alpine J.* 21 (1902): 102–114. **Outram.**

The First Ascent of Mount Assiniboine. By Rev. James Outram. *With Illustrations.*

Canada—Mt. Assiniboine. *Appalachia* 10 (1902): 43–50. **Outram.**

Our Dash for Mt. Assiniboine. By James Outram. *With Plates.*

On the first ascent of Mt. Assiniboine in September, 1901.

Canada—Rocky Mountains. *Appalachia* 10 (1902): 1–19. **Outram.**

The Ottertail Group, Canadian Rockies. By James Outram. *With Plates.*

Mexico. *B.S.R.G. d'Anvers* 26 (1902): 87–138. **George.**

La Terre chaude Mexicaine, suite à la causerie intitulée: Une excursion à travers le Mexique. Par M. Louis George. *With Illustrations.*

North America—History. **Charlevoix, Shea, and Morrison.**

History and General Description of New France. By Rev. R. F. X. de Charlevoix. Translated from the Original Edition and Edited with Notes by Dr. John Gilmary Shea. With a Memoir and Bibliography of the Translator by Noah Farnham Morrison. 6 volumes. London: Francis Edwards, 1902. Size 10 × 8, pp. (vol. i.) xiv. and 286; (vol. ii.) ix. and 284; (vol. iii.) vi. and 312; (vol. iv.) viii. and 308; (vol. v.) x. and 312; (vol. vi.) x. and 256. *Maps, Plans, and Portraits. Presented by the Publisher.*

This is reviewed in the present number.

United States—Alabama. **Martin.**

Internal Improvements in Alabama. By William Elejius Martin. (Johns-Hopkins University Studies in Historical and Political Science, Series XX. No. 4.) Baltimore: Johns-Hopkins Press. April, 1902. Size 9½ × 6, pp. 88.

On the development of roads, railways, harbours, etc.

United States—California. *Science* 15 (1902): 951-954. **Hershey.**

A supposed early Tertiary Peneplain in the Klamath Region, California. By Oscar H. Hershey.

United States—California. **Manson.**

A brief history of Road Conditions and Legislation in California. By Marsden Manson. (Reprinted from *Proceedings*, Am. Soc. Civil Engineers, February, 1902.) Size 9 × 6, pp. 72-98. *Maps.*

Outlines the progress of the movement inaugurated in 1895 for improving the road-system of California.

United States—Climate. *Monthly Weather Rev.* 30 (1902): 19-28, 69-79. **Matthews.**
The term Indian Summer. By Albert Matthews.

This will be the subject of a note.

United States—Idaho. **Russell.**
Geology and Water Resources of Nez Perce County, Idaho. By I. C. Russell. Parts i. and ii. (Department of the Interior, Water-Supply and Irrigation Papers of the United States Geological Survey, Nos. 53 and 54.) Washington, 1901. Size 9 × 6, pp. 142. *Maps and Illustrations.*

A very thorough study of the geology and physical geography (Part i.), and of the water-supply and other economic features (Part ii.) of the area dealt with. The illustrations are a valuable aid to a knowledge of the nature of the country.

United States—Kansas. *B. American G.S.* 34 (1902): 89-104. **Adams.**
Physiographic Divisions of Kansas. By George I. Adams. *With Maps.*

United States—Trade. **Nelson.**
The United States and Its Trade. By Henry Loomis Nelson. (Harper's International Commerce Series.) London: Harper Bros., 1902. Size 8 × 5½, pp. xvii. and 132. *Map. Price* 3*s.* 6*d.*

CENTRAL AND SOUTH AMERICA.

Argentina. *S. and 10th Rep. Liverpool G.S.* (1901): 30-46. **Moreno.**
Scenery of Argentina. By Dr. Francisco P. Moreno.

Brazil. *Petermanns M.* 48 (1902): 92-95. **Huber.**
Zur Entstehungsgeschichte der brasilischen Campos. Von Dr. J. Huber.

Brazilian Guiana. *Rev. G.* 50 (1902): 269-272. **Mathis.**
Les régions de Cachipour, de Counani et de Carsewenne. (Contribution à la géographie des Guyanes.) Par Dr. Constant Mathis.

Brazil and British Guiana. ——
Monthly B. Internat. Bureau American Republics 12 (1902): 1148-1151.
Arbitration Agreement between Brazil and Great Britain. Arbitration Treaty to determine the Limits between Brazil and British Guiana, concluded in London, November 6, 1901, and proclaimed January 28, 1902.

Text of the agreement submitting the settlement of the boundary between the sources of the Takutu and Rupununi to the decision of the King of Italy.

Central America—Canal. *B. American G S.* 34 (1902): 132-138. **Davis.**
The Isthmian Canal. By Arthur P. Davis. *With Profile and Sketch-map.*

Central America—Panama Canal Route. **Heilprin.**
A Defense of the Panama route. By Prof. Angelo Heilprin. Philadelphia: the Franklin Press, 1902. Size 10 × 6½, pp. 12.

The author considers that the Panama route is the true commercial route between the two oceans, and that it presents equal advantages from a constructional point of view.

Chile-Argentine Boundary. **Moulin.**
Le litige Chilo-Argentin et la délimitation politique des frontières naturelles. Par Henri-Alexis Moulin. Paris: Arthur Rousseau, 1902. Size 9 × 5½, pp. 148. *Maps. Presented by the Publisher.*

On the principles involved in the Chilean-Argentine boundary question, and in the demarcation of a natural frontier in general.

Chile and Argentine Republic. ——
Statement presented on behalf of Chile in reply to the Argentine Report, submitted to the Tribunal constituted by H.B. Majesty's Government acting as Arbitrator in pursuance of the Agreement dated April 17, 1896. 4 vols. Also Appendix to same, 2 vols., and case of Maps. London, 1901-2. Size 10 × 7½, pp. xlvi. and 1664; Appendix pp. 948. *Maps and Plates. Presented by the Chilean Legation in London.*

No pains have evidently been spared in the preparation of this statement, which contains a vast amount of important geographical information in the form of descriptions, maps, and illustrations. It forms a virtual compendium of the results of recent exploration from the Chilean side in the Patagonian Andes.

Cuba. *B. American G.S.* 34 (1902): 105–116. **Vaughan and Spencer.**

The Geography of Cuba. By T. Wayland Vaughan and Arthur C. Spencer.

Danish West Indies—Bibliography. **Griffin.**

A List of Books (with references to Periodicals) on the Danish West Indies. By A. P. C. Griffin. (Library of Congress, Division of Bibliography.) Washington, 1901. Size 10½ × 7½, pp. 18.

Ecuador. *La G., B.S.G. Paris* 5 (1902): 340–350. **Bourgeois.**

Opérations de la mission française chargée de la mesure d'un arc de méridien en Équateur. Par R. Bourgeois.

Guatemala. **Maudslay.**

Biologia Centrali-Americana. Edited by F. Ducane Godman. Archæology. By A. P. Maudslay. Part xv. Text (vol. iii., pp. 43–50) and Plates. April, 1902. London: R. H. Porter. Size (Text) 13½ × 10½; (Plates) 13 × 20½.

This instalment deals with the archæological remains at Tikal, which are illustrated by the same superb reproductions of photographs that have accompanied former parts.

Guatemala. *Nature* 66 (1902): 150. **Rockstroh.**

Earthquake in Guatemala. By Edwin Rockstroh. *With Map.*

Peru. *B.S.G. Lima* 11 (1901): 62–113. **Samudio.**

El caucho y la shiringa. Por el doctor Manuel Patiño Samudio. *With Map.*

On the possible development of the Eastern provinces of Peru by the encouragement of immigration and the opening of navigation on the rivers, etc.

Santo Domingo. *P.A. Nat. Sci. Philadelphia* 53 (1901): 554–561. **Harshberger.**

An Ecological Sketch of the Flora of Santo Domingo. By John W. Harshberger, PH.D. *With Plates.*

Tierra del Fuego. **Rabot.**

Charles Rabot. La Terre de Feu d'après le Dr. Otto Nordenskjöld. Paris: Hachette & Co., 1902. Size 7½ × 5, pp. iv. and 212. *Map and Illustrations. Price 4 fr. Presented by the Author.*

Dr. Nordenskjöld's account of his journey having been brought out in Swedish, M. Rabot has done good service by making it more generally accessible through a French version.

West Indies. *Nature* 66 (1902): 56–58, 107–112, 151–153. **Milne.**

The recent Volcanic Eruptions in the West Indies. By Prof. J. Milne, F.R.S.

West Indies. *Rev. Scientifique* 17 (1902): 769–775. **Velain.**

Le cataclysme volcanique des Antilles. Par Ch. Vélain. *With Illustrations.*

West Indies—Martinique. *Questions Dipl. et Colon.* 13 (1902): 676–685. **De la Peyre.**

La catastrophe de la Martinique. Aperçus économiques. Par Jean de la Peyre. *With Maps.*

West Indies—Martinique. *C. Rd.* 134 (1902): 1246–1248, 1369–1371. **Lacroix.**

Les roches volcaniques de la Martinique. Note de M. A. Lacroix.

West Indies—Martinique. *C. Rd.* 134 (1902): 1327–1329. **Lacroix.**

Sur les cendres des éruptions de la Montagne Pelée de 1851 et de 1902. Note de M. A. Lacroix.

West Indies—St. Vincent. *Mission Field* 47 (1902): 241–244. ———

The Disasters of St. Vincent. *With Map and Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. *Deutsch. G. Blätter* 25 (1902): 1–49, 105–155. **Wiedemann.**

Beobachtungen über den Handel und Verkehr Australiens; gesammelt während einer wirtschaftsgeographischen Studienreise 1900–1901. Von Dr. Max Wiedemann.

Australian Commonwealth. ———

Commonwealth of Australia Constitution Bill. Reprint of the Debates in Parliament, the Official Correspondence with the Australian Delegates, and other papers. London: Wyman & Sons, 1900. Size 10 × 6½, pp. v. and 200. *Presented by the Secretary of State for the Colonies.*

British Solomon Islands. ——

British Solomon Islands. Report for 1900–1901. Colonial Reports, Annual. No. 347, 1902. Size 9½ × 6, pp. 20. *Price 1½d.*

Chatham Islands. **Dendy.**

Mem. and P. Manchester Lit. and Philosoph. S. 46 (1902): No. 12, 1–29.

The Chatham Islands: a Study in Biology. By Arthur Dendy, D.SC.

Marianne Islands. *M. Deutsch. Schutzgeb.* 15 (1902): 96–118. **Fritz.**

Reise nach den nördlichen Marianen. Von Bezirksamtmann Fritz. *With Illustrations.*

This will be noticed in the Monthly Record.

New South Wales. ——

1901. Legislative Assembly, New South Wales. Annual Report of the Department of Mines, New South Wales, for the Year 1900. Sydney: W. A. Gullich, 1901. Size 13 × 8½, pp. iv. and 218. *Plans, Diagrams, and Illustrations.*

The value of the mineral production in 1900 was 6½ million pounds, an increase of over 2 millions as compared with the production five years previously. Silver, lead, coal and coke, copper, and tin, all show satisfactory increases on the amounts in 1899.

New South Wales. ——

The Year-Book of New South Wales. Compiled by the Editor of the 'Year-Book of Australia,' for circulation by the Agent-General in London, 1902. Size 8½ × 5½, pp. 168. *Map. Presented by the Agent-General for New South Wales.*

New South Wales. **Andrews.**

Report on the Kiandra Lead. By E. C. Andrews, B.A. (New South Wales, Department of Mines and Agriculture. Geological Survey, Mineral Resources, No. 10.) Sydney, 1901. Size 9½ × 6½, pp. 32. *Maps, Sections, and Illustrations. Presented by the Geological Survey, New South Wales.*

New Zealand. ——

Statistics of the Colony of New Zealand for the Year 1900. Wellington, 1901. Size 13 × 8½, pp. xvi. and 550.

Pacific Ocean—Tides. *B. American G.S.* 34 (1902): 17–25, 117–131. **Brownlie.**

The Tides in the midst of the Pacific Ocean. A study by Alexander Brownlie.

Queensland. ——

'The Clarion.' Edited by Randolph Bedford. Queensland Number. [Melbourne, 1901.] Size 19½ × 14½, pp. 62. *Illustrations. Presented by the Chief Secretary, Brisbane, Queensland.*

Queensland. **Ball.**

Report on the Hamilton and Coen Gold Fields. By Lionel C. Ball. Brisbane, 1901. Size 13 × 8½, pp. 28. *Maps.*

Queensland. **Ball.**

Report on the Jordan Creek Gold Field. By Lionel C. Ball. Brisbane, 1901. Size 13½ × 8½, pp. 8. *Map.*

Queensland. **Dunstan.**

Report on Geology of the Dawson and Mackenzie Rivers, with special reference to the occurrence of Anthracitic Coal. By B. Dunstan. Brisbane, 1901. Size 13 × 8½, pp. 28. *Map, Plans, and Sections.*

Queensland. **Rands.**

Fourth Report on the Gympie Gold Field, having special reference to the Inglewood Dyke and the Eastern Leases. By William H. Rands. Brisbane, 1901. Size 13½ × 8½, pp. 18. *Map and Illustrations.*

Queensland. **[Traill.]**

A Queenly Colony. Pen Sketches and Camera Glimpses. [By W. H. Traill.] [Brisbane, 1901.] Size 12½ × 10, pp. viii. and 142. *Maps and Illustrations. Presented by the Agent-General for Queensland.*

An outline of the history of colonization in Queensland, written to accompany reproductions of photographs in the possession of Government departments.

Society Islands—Raiatea. *B S. Neuchateloise G.* 14 (1902): 1–246. **Huguenin.**

Raiatea la Sacrée. Par Paul Huguenin. *With Map and Illustrations.*

Tasmania. ——

Handbook of Tasmania, with List of Reference Works on the Agricultural, Pastoral, Horticultural, and Mineral Resources of the Colony. Launceston, 1899. Size 8½ × 5½, pp. 32. *Map.*

Victoria. *P.R.S. Victoria* 14 (1902): 153–165. **Kitson.**

Observations on the Geology of Mount Mary and the Lower Werribee Valley. By A. E. Kitson.

Victoria—Mount Macedon. *P.R.S. Victoria* 14 (1902): 185–217. **Gregory.**

The Geology of Mount Macedon, Victoria. By Dr. J. W. Gregory, F.R.S. *With Plates.*

POLAR REGIONS.

Antarctic—German Expedition. *Z. Ges. Erdk. Berlin* (1902): 323–332. **Schott.**

Von der Deutschen Südpolar-Expedition. Aus dem Bericht über die wissenschaftlichen Arbeiten auf der Fahrt von Kiel bis Kapstadt. Von Dr. G. Schott.

Antarctic—Natural History. ——

Report on the Collections of Natural History made in the Antarctic Regions during the voyage of the *Southern Cross.* London, 1902. Size 10 × 6, pp. 344. *Plates and Illustrations. Presented by the Trustees of the British Museum.*

The collections made by members of the Newnes Expedition in various branches of Natural History are here described by a number of specialists. As is well known, Mr. Nicolai Hanson, the zoologist of the expedition, was particularly well fitted for the work he had undertaken, and before his lamented death was indefatigable in collecting the forms of life observed. His premature death was a great loss to science, and had he been spared to return, the results of the expedition, from the point of view of zoology, would have been still greater. As it is, the volume, which includes the notes made by Mr. Hanson in his private diary, marks an important advance in our knowledge of the Southern fauna, and the report on the rock specimens is also of much interest. The work is illustrated by a series of excellent plates.

Antarctic—Swedish Expedition. *Scottish G. Mag.* 18 (1902): 312–314. **Nordenskjöld.**

The Swedish Antarctic Expedition. Some notes of its first month of work. By Otto Nordenskjöld.

Arctic—Ice-conditions. **Garde.**

The state of the ice in the Arctic Seas, 1901. Published by the Danish Meteorological Institute, on invitation of the VIIIth International Geographical Congress. Prepared by V. Garde. (Special print of the nautical-meteorological Annual of the Danish Meteorological Institute.) Size 12½ × 9½, pp. xxiv. *Charts.*

See note in the Monthly Record for July.

Arctic—Russian Expedition. *Petermanns M.* 48 (1902): 66–68, 83–88. **Toll.**

Russische Polar Expedition unter Leitung von Baron Ed. Toll. Bericht über die Fahrt der "Sarja" durch die Kara-See und über die Arbeiten des Jahres 1900. Von Eduard v. Toll.

Arctic—Russian Expedition. *Z. Ges. Erdk. Berlin* (1902): 242–247. **Toll.**

Von der Russischen Polar-Expedition. Berichte des Leiters der Expedition. Baron Ed. Toll.

Greenland. *G. Tidskrift* 16 (1901–1902): 133–142. **Hartz.**

Den Østgrønlandske Expedition 1900. Skibsexpeditionen fra Kap Dalton til Kong Oscars Fjord. Ved N. Hartz.

On the voyage of the *Antarctic* (Amdrup Expedition) along the Greenland Coast.

MATHEMATICAL GEOGRAPHY.

Astronomical Observations. *Ann. Hydrographie* 30 (1902): 152–156. **Wendt.**

Korrespondirende Höhen. Von Dr. Ernst Wendt.

On the determination of the longitude by corresponding, as opposed to equal, altitudes, *i.e.* by altitudes observed at equal hour angles before and after noon.

Astronomy. **Crommelin.**

An Adaptation of Major Grant's Graphical Method of Predicting Occultations to the Elements now given in the Nautical Almanac. By A. C. D. Crommelin. London: Royal Geographical Society, 1902. Size 10 × 6½, pp. 6. *Diagrams.*

Astronomy. **Guyon.**

Un nouveau Planétaire. Par G. Guyon. (Université Nouvelle. Institut Géographique de Bruxelles, Publication No. 7.) Bruxelles, 1902. Size 10 × 6½, pp. 14. *Diagram.*

Astronomy. ——

The American Ephemeris and Nautical Almanac for the year 1905. First Edition. Washington, 1901. Size 10½ × 7½, pp. viii. and 596.

Globe-Sections. *Z. Ges. Erdk. Berlin* (1902): 59–63. **Maes.**

Ueber Herstellung von Globusscheiben. Von Valère Maes.

Latitude and Longitude. *Naturw. Wochenschrift* 1 (1902): 270–271. **Schmidt.**

Die Ausdrücke "Länge" und "Breite" in der Geographie. Von Prof. Dr. Max C. P. Schmidt.

Traces the development of the idea of length and breadth as applied to the Earth from the time of the early Greeks, with the parallel notion of a right and a left side (north and south).

Lunar Distances. *Rev. Maritime* 153 (1902): 943–963. **Guyon.**

La méthode des distances lunaires. Par le capitaine E. Guyon.

Map-projection. *American J. Sci.* 13 (1902): 245–275, 347–376. **Penfield.**

On the use of the Stereographic Projection for Geographical Maps and Sailing Charts. By S. L. Penfield. *With Illustrations. Also separate copy, presented by the Author.*

The writer urges that greater use should be made of the advantages offered by the stereographic projection.

Map-projection. *J. Manchester G.S.* 17 (1901): 183–185. **Stromyer.**

A Conical Surface Equivalent Projection. By C. E. Stromyer.

Advocates the mapping of the world on a conical equal area projection in a series of zones, the angles of the conical mantles varying with the latitude.

Surveying. **Middleton.**

Surveying and Surveying Instruments. By G. A. T. Middleton. Second Edition. Revised and Enlarged. London: Whittaker & Co., 1902. Size 7½ × 5, pp. 150. *Diagrams. Price 5s. Presented by the Publisher.*

Treats principally of land surveys with chain, level, theodolite and plane-table.

Tables. **McKirdy.**

Time, Tide, and Distances. A Handy Book of Reference for the Shipowner, Underwriter, or Traveller, useful also in the Club House or the Smoking Room. By Commander J. McKirdy. London: J. D. Potter, 1902. Size 10 × 12½, pp. 42. *Map and Movable Diagrams. Price 5s. Presented by the Publisher.*

This shows, in a convenient form for reference, (1) the time of the world as compared with that of Greenwich; (2) the tides round the British coasts and on the eastern route to Japan, with that at London Bridge; (3) Distances from British ports to over 1300 places at home and abroad; (4) tables for conversion of speed and time into distance, and the converse; the first two by means of revolving discs.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Bio-geography. **Hutton.**

The Lesson of Evolution. By Frederick Wollaston Hutton. London: Duckworth & Co., 1902. Size 7½ × 5, pp. viii. and 102. *Presented by the Author.*

A sketch of the probable history of life on the Earth.

Geomorphology. *Sitzb. A.W. München* (1902): 17–38. **Günther.**

Ueber gewisse hydrologisch-topographische Grundbegriffe. Von S. Günther.

Glaciers. *Rev. G.* 50 (1902): 238–247. **Rabot.**

Les glaciers et les phénomènes glaciaires. Par Charles Rabot.

Gravity Determination. *Sitzb. A.W. Berlin* (1902): 126–128. **Helmert.**

Dr. Hecker's Bestimmung der Schwerkraft auf dem Atlantischen Ocean. Von F. R. Helmert.

On observations during a voyage to South America in July and August, 1901.

Mountain Systems. *C. Rd.* 134 (1902): 998–1000. **Meunier.**

Observations sur les pôles orogéniques. Note de M. Stanislas Meunier.

On the writer's theory that the mountain-systems of the two hemispheres are arranged symmetrically round two orogenic poles.

Oceanography. *C. Rd.* 134 (1902): 961-964. **Monaco.**
Sur la troisième campagne de la *Princesse Alice II.* Note de S. A. S. le Prince Albert de Monaco.

Oceanography—Atlantic. **Ryder.**
Nautical-Meteorolog. Ann., Danish Meteorolog. I. (1901): xxxi.-lxii.
Some investigations relating to the ocean currents in the sea between Norway, Scotland, and Greenland. By C. Ryder. *With Maps.*

On observations made by the author while in command of one of the Iceland mail steamers.

Oceanography—Atlantic. *C. Rd.* 134 (1902): 1077-1079. **Thoulet.**
Etude d'échantillons d'eaux et de fonds provenant de l'Atlantique Nord. Note de M. J. Thoulet.

Oceanography—Mediterranean. *C. Rd.* 134 (1902): 1459-1460. **Thoulet.**
Sur une série verticale de densités d'eaux marines en Méditerranée. Note de M. J. Thoulet.

Oceanography—Methods. *C. Rd.* 134 (1902): 1385-1387. **Richard.**
Sur une nouvelle bouteille destinée à recueillir l'eau de mer à des profondeurs quelconques. Note de M. Jules Richard. *With Illustration.*

Phenology. **Ihne.**
Phaenologische Mitteilungen (Jahrang 1901). Von E. Ihne. (Sonder-Abdruck aus den Abhandlungen d. Naturhist. Gesellsch, XIV. Bd., Nürnberg.) Size 8½ × 6, pp. 36.

Physical Geography. *Rev. G.* 50 (1902): 312-322. **Meunier.**
Géographie physique et géologie. Par Stanislas Meunier.

Phyto-geography. *Naturw. Wochenschrift* 1 (1902): 253-255. **Vogler.**
Die Bedeutung der Verbreitungsmittel der Pflanzen in der alpinen Region. Von Dr. Paul Vogler.

The author shows the preponderance among strictly alpine plants of the forms whose seeds are disseminated by the agency of wind.

River-gorges. *C. Rd.* 134 (1902): 1160-1163. **Brunhes.**
Sur un principe de classification rationnelle des gorges creusées par les cours d'eau. Note de M. Jean Brunhes.

Snow. *Meteorolog. Z.* 19 (1902): 205-211. **Bührer.**
Ueber den Einfluss der Schneedecke auf die Temperatur der Erdoberfläche. Von W. Bührer.

Tidal Bore. *B. American G.S.* 34 (1902): 146-149. **Booraem.**
Note on the Tidal Bore. By John V. V. Booraem. *With Diagrams.*

Volcanoes. *Rev. Scientifique* 17 (1902): 737-744. **Taquin.**
La théorie des volcans. Par M. A. Taquin.

The author attributes volcanic eruptions to electric influences, and holds that they are in close relation to the meteorological conditions of the globe.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. *G.Z.* 8 (1902): 266-285. **Halbfass.**
Die Binnenseen und der Mensch. Eine kulturgeographische Skizze. Von Wilhelm Halbfass.

Commercial—Bamboos. *Rev. G.* 50 (1902): 404-423. **Rivière.**
Les bambous, Répartition geographique, végétation, usages. Par Ch. Rivière.

Commercial Geography—Cacao. **Preuss.**
Société d'Études Coloniales de Belgique. Le Cacao. Sa Culture, Sa Preparation. Par le Dr. Paul Preuss. Extrait du Bulletin de la Société. Bruxelles: A. Lesigne, 1902. Size 9½ × 6½, pp. 128. *Illustrations. Presented by the Société d'Études Coloniales.*

Dr. Preuss's reputation as an economic botanist is a voucher for the accuracy of this monograph, which is based on the author's own observations during his journey in Central and South America. It is extracted from the larger work, in which the results of that journey were described.

Ethnology—Pygmies. *Globus* 81 (1902): 325-327. **Kollmann.**
Pygmäen in Europa und Amerika. Von J. Kollmann.

Historical—Early Map. *B.S.G. Italiana* 3 (1902): 438-449. **Magnocavallo.**
La carta "de mari mediterraneo" di Marin Sanudo "il Vecchio." Nota del Prof. A. Magnocavallo. *With Plates.*

GENERAL.

Anglo-Jewish Association. ——
The Thirty-first Annual Report of the Anglo-Jewish Association, 1901-1902. London: the Anglo-Jewish Association, 1902. Size 8½ × 5½, pp. 112. *Map. Presented by the Association*

The map shows the schools throughout Europe subsidized by the Anglo-Jewish Association.

Bibliography. **Knox.**
Geographical Index (Extra-European) to Books, Periodicals, &c. Compiled in the Intelligence Division, War Office. By Alexander Knox, B.A., Map Curator. London: Harrison & Sons, 1901. Size 10½ × 7, pp. xiv. and 72.

Bibliography—Science. ——
Catalogue of Scientific Papers (1800-1883). Supplementary Volume. Compiled by the Royal Society of London. Vol. xii. London: C. J. Clay & Sons, 1902. Size 11½ × 8½, pp. xxxii. and 808. *Presented by the Royal Society.*

In this volume (edited by the late Mr. G. Griffith) papers are catalogued which appeared from 1800 to 1883 in periodicals not indexed in the main work. Of these over 350 have been dealt with, and as they include many not generally known beyond the country in which they are published, the references to papers in them will bring to light much work that has hitherto been passed over by students. The literature of the years 1883-1900 will be dealt with in subsequent volumes, completing the work to the end of last century.

British Empire. *Nineteenth Century* 51 (1902): 716-731. **Johnston.**
Problems of the Empire. By Sir Harry H. Johnston, K.C.B.

Education. ——
Board of Education. Special Reports on Educational Subjects. Volume 8. Education in Scandinavia, Switzerland, Holland, Hungary, &c. London: Eyre & Spottiswoode, 1902. Size 9½ × 6, pp. viii. and 704. *Map and Diagram. Price* 3*s*. 2*d*.

Deals with the general organization of education in the different countries, with brief descriptions of the school curricula. A section deals with school journeys in Yorkshire, etc.

Educational—Ordnance Maps. *G. Teacher* 1 (1902): 61-67. **Geikie.**
The Use of Ordnance Maps in Teaching Geography. By Sir Archibald Geikie, F.R.S

Europe and Asia. **Norman.**
All the Russias. Travels and Studies in Contemporary European Russia, Finland, Siberia, The Caucasus, and Central Asia. By Henry Norman. London: W. Heineman, 1902. Size 9½ × 6, pp. xvi. and 476. *Maps and Illustrations. Price* 18*s. net.*

The object of this work, which is based on fifteen years' study and four journeys in European and Asiatic Russia, is "to present a picture of the aspects of contemporary Russia of most interest to foreign readers, with especial reference to the recent remarkable industrial and commercial development of Russia."

French Colonies. **Fallot.**
E. Fallot. L'Avenir Colonial de la France. Études pratiques sur les principes de la colonisation et la situation économique des colonies françaises et étrangères. Paris: Ch. Delagrave. Not dated. Size 7½ × 5, pp. viii. and 550. *Maps. Price* 5*s*.

A useful *résumé* of the present condition and prospects of the French colonies, with comparisons with those of other nations.

German Colonies. ——
Weissbuch. Zweiundzwanzigster Theil. Berlin: Carl Heymanns Verlag, 1902. Size 12½ × 9, pp. 112, 4, and 352.

Livingstone College. ——

Livingstone College Calendar and Year-Book, containing a Record of a Year's Progress in matters of Health, Outfit, and Travel. London: Travellers' Health Bureau. Size 7½ × 5, pp. 90. *Illustrations. Price* 6*d.*

Mosquito Destruction. **Ross.**

Mosquito Brigades and how to organise them. By Ronald Ross. London; George Philip & Son, 1902. Size 9 × 5½, pp. vii. and 100. *Price* 3*s. net. Presented by the Publishers.*

Shows in a concise form the way in which the apparently hopeless task of mosquito destruction may be carried out with prospect of success. The motto adopted as pointing to the most important means of fighting the mosquito pest is "No stagnant water."

Photography. *J. African S.* (1902): 302-311. **Lee.**

Photography as an Aid to the Exploration of New Countries. By J. Bridges Lee. *With Illustrations.*

Principles of Geography. **Mello.**

Les Lois de la Geographie. 1^{re} Étude. I. Introduction Générale. II. La Géophysique Statique. III. Bibliographie Systématique de la Géophysique. Par Carlos de Mello. Berlin: R. Friedlander & Son, 1902. Size 9 × 6, pp. viii. and 360. *Illustrations. Price* 12*s.*

This makes no claim to be a systematic text-book, but treats of the principles of geography under certain special aspects. The author advocates a synthetic as opposed to an analytical treatment of the subject, and gives his views as to what he calls the laws of terrestrial asymmetry and the mutual interdependence of the surface features of the Earth. An extensive chronological bibliography is added, serving in part as a guide to the historical development of geographical theory, but including sections on special features—rivers, valleys, lakes, etc. It is to be completed at a future date by further special sections.

South Africa and India. *Nineteenth Century* 51 (1902): 706-715. **Griffin.**

South Africa and India. By Sir Lepel Griffin, K.C.S.I.

Recommends an organized immigration of Indian settlers in South Africa as the only satisfactory means of supplying an adequate population.

Spanish Language. **De Arteaga.**

Practical Spanish. A Grammar of the Spanish Language, with exercises, materials for conversation, and vocabularies. By Fernando de Arteaga y Pereira. 2 Parts. Part i. Nouns, Adjectives, Pronouns—Exercises. Part ii. Verbs, etc., with copious vocabularies. London: John Murray, 1902. Size 7½ × 5, pp. (Part i.) viii. and 258; (Part ii.) x. and 362. *Price* 7*s.* 6*d. Presented by the Publisher.*

A special feature in this grammar is the immense trouble which is taken to explain, by means of examples, both the regular and idiomatic uses of Spanish grammatical constructions. This is no doubt valuable from certain points of view, but the resulting diffuseness detracts somewhat from the practical value of the book to other than serious students. The fundamental principle underlying certain usages is sometimes masked by the elaborate distinctions introduced, while on the other hand uses not strictly parallel are occasionally classed together.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from July 1 to 31, 1902.

4 miles to 1 inch:—

Hill-shaded map, printed in colours, in sheets (5 and 6). 1*s.* 6*d.*

6-inch—County Maps:—

Cambridgeshire, 14 N.W., 15 S.W., 24 N.E., 32 S.W., 38 N.W., 45 N.W. **Dorsetshire**, 1 S.E., 2 S.W., 3 N.E., 4 S.W., S.E., 7 N.E., 8 N.W., N.E., S.W., 9 (N.W. and S.W.), N.E. (S.W.

and N.W.), S.E., 10 N.W., S.W., 13 N.E., S.E., 14 S.E., 15 N.E., S.E., 16 S.E., 23 N.W., N.E., 24 S.E., 25 N.W., 56 N.W. **Huntingdonshire**, 6 N.W., 7 S.W., 8 S.E., 9 N.W., 12 S.W., 13 N.E., 14 S.W., S.E., 15 N.E., S.W., 21 S.E., 22 N.E., S.W., 24 S.E., 26 N.W., 28 N.W. **Monmouthshire**, 1 N.W., N.E., 6 N.W. (8 N.E. and 9 N.W.) (10A S.E. and 11A S.W.), 11 N.W., N.E. (11A S.W. and 10A S.E.), 28 S.E., 29 N.E., 30 S.E., 38 N.W., N.E. **Staffordshire**, 44 N.E, 47 N.W. 1*s. each.*

25-inch—County Maps:—

Cambridgeshire, I. 15, 16; IV. 2, 3, 15; VII. 7, 11, 12; XVII. 13, 15, 16; XX. 16; XXI. 8, 12, 15, 16; XXII. 1, 3, 4, 6, 8, 9, 10, 12, 13; XXV. 4, 6, 7, 10, 11, 12; XXVI. 1; XXXIII. 6; XLIV. 16. **Dorsetshire**, VII. 9, 13; XXII. 4, 11, 13, 15, 16; XXXI. 1, 4, 5, 7, 9, 10, 11, 12, 13, 14, 15, 16; XXXII. 9, 10; XL. 2, 3, 8; XLI. 2, 5, 6, 10, 13, 14; XLVIII. 1, 2, 4, 5, 6, 7, 9, 10, 13, 14, 15, 16; XLIX. 5, 9, 10; LIV. 4. **Gloucestershire**, X. 15; XII. 9, 13; XXV. 12, 15; XXX. (3 and 7); XXXIII. 1, 2, 5, 8; XXXIV. 1, 2, 3, 4, 6, 7, 8; XXXV. 1, 16; XXXVII. 9, 14. **Huntingdonshire**, XXVII. 16. **Montgomeryshire**, XXIII. 10, 11, 12, 14, 15; XXIV. 13; XXIX. 14, 15, 16; XXX. 1, 5, 6, 7, 8, 12; XXXVI. 2, 4, 6, 8; XLII. 1, 2, 3. **Shropshire**, XXXIV. 6, 7, 14, 15; XXXVI. 7, 8; XXXVII. 7, 9, 10, 11, 14; XXXIX. 13; XL. 2, 4, 6, 7, 8, 9, 10, 12; XLI. 1, 2, 3, 5, 6, 7, 9; XLV. 13; XLVI. 12. **Staffordshire**, XXVIII. 3, 4, 8; XLIX. 4, 8; L. 3, 5, 13; LI. 6, 10, 13, 15, 16; LII. 15; LVI. 3, 4, 6, 7, 8, 14, 15, 16; LVII. 2, 4, 5, 7, 9, 10, 11, 12, 14, 15, 16; LVIII. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; LIX. 1, 2, 4, 7, 8, 9, 10, 13, 14, 15; LX. 1; LXII. 8. **Warwickshire**, II. 4, 7, 8, 15; III. 1; IVA. 15. **Worcestershire**, LIII. 15; LV. 9 (Areas of Bredon Parish only). **Yorkshire**, CCXCVI. 6; CCXCVII. 5, 9, 13. 3*s. each.*

(***E. Stanford, London Agent.***)

Bulgaria. **Kassner.**

Verteilung der jährlichen Niederschläge in Bulgarien. Von Dr. C. Kassner. Scale 1 : 1,500,000 or 23·6 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1902, Tafel 11. Gotha: Justus Perthes. *Presented by the Publisher.*

Historical Atlas. **Poole.**

Historical Atlas of Modern Europe from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World connected with European History. Edited by Reginald Lane Poole, M.A., PH.D., Fellow of Magdalen College, and Lecturer in Diplomatic in the University of Oxford. Part XXX. Oxford: The Clarendon Press; London, Edinburgh, Glasgow, and New York: Henry Frowde, M.A.; Edinburgh: W. & A. K. Johnston. 1902. *Price* 3*s.* 6*d. each part. Presented by the Clarendon Press.*

With the publication of the present part this excellent historical atlas of modern Europe is completed, and the editor and publishers may be congratulated on having produced a work that supplies a long-felt need in this country, and one that will doubtless be highly appreciated by all students of historical geography.

The editor in his preface, which appears with this part, fully acknowledges his indebtedness to those whose works he has consulted and which have been made use of in the preparation of this atlas, the principal of these being the famous Spruner-Menke 'Hand-Atlas zur Geschichte des Mittelalters und der neueren Zeit,' Droysen's 'Allgemeiner Historischer Hand-Atlas,' Longnon's 'Atlas Historique de la France,' and the volume of maps to accompany Freeman's 'Historical Geography of Europe.' However, the maps in certain sections, specially those illustrating Byzantine, Asiatic, and colonial history, and the British Isles, are in most respects independent of any previous atlas. The latter, which number altogether sixteen, are exceptionally valuable, and far more complete than any maps of a similar character. As mentioned in the title, the period embraced commences with the decline of the Roman Empire, and as a definite year for its close that selected is 1897, the sixtieth year of the reign of the late Queen Victoria. There is but one exception to this, and that is South Africa, in which case it has been considered desirable to add a supplementary map showing the historical development of that region previous to the annexation of the Boer Republics in 1900. The atlas contains altogether ninety maps, all of which are accompanied by letterpress. A list of the maps is given with this part, together with the authors' names, which are alone sufficient to inspire confidence in the work.

The maps contained in this closing part are: No. 41, Germany, 1648–1795, by C. Grant Robertson, M.A.; No. 84, India in 1782 and 1845, by Prof. Oman; No. 90, South Africa previous to the suppression of the Boer Republics, by G. Geoffrey Robinson, M.A.

Vienna. **Hartleben.**

Plan der Reichshaupt- und Residenzstadt Wien mit Angabe der neuen Bezirkseintheilung und den früheren Gemeindegrenzen. Scale 1 : 20,000 or 386 yards to an inch. Vienna : A. Hartleben.

A new edition of a good clear plan of Vienna, printed in colours.

Relief Map. **Morrell.**

Nature-Study : Realistic Geography. Model based on the 6-inch Ordnance Survey. Designed by G. Herbert Morrell, M.A. London : Edward Stanford. *Price* 3*s*. *Presented by the Publisher.*

Teachers of geography are increasingly realizing the importance of training their pupils in map-reading, and it is encouraging to find how many schools now possess the Ordnance Survey sheets of the locality in which they are situated, for a constant comparison of a real scene with its map-representation is one of the surest means by which children can learn to grasp the meaning of all maps. By this method children soon learn to understand a map, in so far as the horizontal is concerned, but the power of interpreting the modes of representing relief, conventionally adopted in maps, can only be very gradually acquired.

It is with the object of helping children to realize relief, as represented by contour-lines, that a model of the country surrounding Streatley-on-Thames has been designed by Mr. G. H. Morrell, M.A. The model is composed of layers of cardboard cut out according to the contour-lines, each representing 50 feet of elevation, which are marked on the war-game edition of the 6-inch Ordnance Survey of Berkshire, and then superimposed in their proper position. It is sold in a portfolio, which also contains several pieces of cardboard, each stamped with a contour-line drawn from the same map, but not cut out, so that a second model of the same district could be easily constructed.

Models of this kind have for years been regularly constructed by the pupils at Dr. Beust's school near Zürich, and occasionally by those of a few other schools and colleges in this country as well as abroad, but the time and trouble involved in separately tracing the required lines on to pieces of cardboard may have prevented the method from being more widely adopted. In some schools abroad the practice has even been partially relinquished, on the ground that it has become rather a manual than a geographical training, while it is also well to remember that there is a danger of such models emphasizing the *terraced* idea of relief a child is all too ready to derive from the study of a contoured map.

The constant comparison of the model with the reality and the use of a little plasticine for finally obliterating the terraced effect would probably counteract the latter evil, and though it would be unwise to devote a great deal of time to this occupation, a child would certainly be far better able to appreciate the significance of contour-lines after he had constructed, or watched the construction of, one of these models, than he could without such a practical demonstration.

ASIA.

Central Asia. **Hedin.**

Uebersicht meiner Reisen in Zentralasien. Von Dr. Sven v. Hedin. Scale 1 : 7,500,000 or 118·3 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1902, Taf. 15. Gotha : Justus Perthes. *Presented by the Publisher.*

A small-scale general map of Central Asia, taken from sheet No. 62 of Stieler's Hand Atlas, upon which have been laid down the routes taken by Dr. Sven Hedin on his recent and earlier journeys. Although only a preliminary map, it serves to illustrate generally the short paper which it accompanies.

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 4 miles to an inch. Sheets : 23 N.W., parts of Bhávnagar, Jetpur, Pálitána, and Minor Native States of Káthiáwár Agency, and district Ahmedabad (Bombay Presidency), additions to 1897, 1901. 76 N.E., parts of districts Kurnul, Nellore, and Kistna (Madras Presidency), additions to 1899. 76 S.E., parts of districts Nellore, Kistna, and Kurnul (Madras Presidency), additions to 1899. 77 S.W., parts of districts Cuddapa and North Arcot (Madras Presidency), and Kolar (Mysore State), 1901. 86 S.W., parts of districts Kheri, Sitapur, and Bahraich (Oudh), and of Nepal, additions to 1898, 1899.—Bombay Survey, 1 mile to an inch. Sheet 231, districts Poona and Ahmednagar, Season 1878–79, additions and corrections up to February, 1898, 1901.—Burma Survey, 1 mile to an inch. Preliminary edition. Sheet 145 (new series), district Shwebo, Season 1892–96, 1901.—Central India and Rajputana Survey, 1 mile to an inch. Sheets : 120, parts of Native States, Idar, and Danta (Bombay Presidency), and of Sirohi and Udaipur (Rajputana Agency), Season 1880–81, 1901; 267, parts of Kotah, Bundi, and Udaipur (Rajputana Agency), Seasons 1869-71, 1901; 278, parts of Indore Gwalior, Dewás, and Dhár, Native States, and Mánpur (Central India Agency), Season 1873-74, additions and corrections up to April, 1895, 1901; 408, parts of Bhopal (Central India Agency), and district Saugor (Central Provinces), Seasons 1854-57, 1862-63, and 1871-72, 1901; 451, parts of districts Mandla and Jubbulpore (Central Provinces), and Native State of Rewah (Central India Agency), Seasons 1860-61 and 1873-74, 1901.—Lower Provinces Revenue Survey, 1 mile to an inch, district Monghyr. Sheets 5 and 6, with additions to boundaries, 1897, 1901.—Lower Provinces, Bihar—Bengal; district Shahabad, 4 miles to an inch, with additions and corrections to railways, boundaries, roads and canals up to April, 1900, 1901.—Western Bengal, 8 miles to an inch. Sheet 9, containing district Balasore and parts of districts Midnapore, Cuttack, Singhbhum, Ranchi, Manbhum, Bankura, Hughly, and Howrah, Mayurbhanja, Keonjhar, Talcher, Pallahara, and Dhenkanal, with addition of railway and corrections to boundaries up to May, 1900, 1901.—Madras Survey, 1 mile to an inch; 2nd edition, sheet 76, parts of districts Mysore, Hassan, and Tumkur (Mysore), Season 1882-83, with corrections to boundaries up to February, 1890, 1901.—North-Western Provinces and Oudh Survey, 1 mile to an inch. Sheet 119, districts Lucknow, Unao, Bara Banki, Sitapur, and Hardoi, Seasons 1862-64, with additions and corrections up to April, 1898, 1901.—Northern Trans-Frontier, 2 miles to an inch; 2nd edition. Sheet 35, parts of Dir, Buner, Swát and Indus Valleys, Seasons 1888-98, 1899.—Sind Survey, 1 mile to an inch. Sheet 9, district Kurachi, Season 1898-99, 1901.—Survey of India Department, 2 miles to an inch; 2nd edition. Sheets: 19, parts of Kalat (Baluchistan) and Sind, Seasons 1897-99, 1901; 21 and 40 (Sind), Season 1898-99, 1901; 71 (Sind), Seasons 1897-99, 1901; 79 (Sind), Season 1899-1900, 1901.—Map of Sundurbuns, compiled under the direction of the Commissioner in the Sundurbuns, by James Ellison, Surveyor of the Sundurbuns, 1873, 4 miles to an inch, with additions and corrections up to 1891; 2 sheets, 1901.—Index to the Standard Sheets of the Central Provinces, 50 miles to an inch. Additions to 1901.—Index to the Standard Sheets of the North-Western Provinces and Oudh, 50 miles to an inch. Additions to 1901. *Presented by H.M. Secretary of State for India, through the India Office.*

AFRICA.

South Africa. **Hausermann.**

Carte des Missions Catholiques du Sud Africain. Scale 1 : 4,000,000 or 63 stat. miles to an inch. *Supplément au Journal Les Missions Catholiques*, 6 Juin, 1902. Paris: R. Hausermann.

The whole of the African continent south of Lake Nyasa and the Zambezi is shown upon this sheet, which is intended to form part of a general map of the continent upon the same scale, of which other sheets have already appeared. It is printed in colours—water blue, hills brown, and lettering black, and shows the boundaries of Catholic mission vicarials and prefectures, and the positions of Catholic mission stations in red. The map is given as a supplement to *Les Missions Catholiques* for June 6 of the present year.

AMERICA.

Canada. **Surveyor-General's Office, Ottawa.**

Sectional Map of Canada. Scale: 190,080 or 3 stat. miles to an inch. Humboldt Sheet (45), West of Second Meridian. Revised to June 21, 1902. Surveyor-General's Office, Ottawa, 1902. *Presented by the Surveyor-General of Canada.*

This sheet includes the area between lat. 51° 48′ and 52° 30′ N., and long. 104° 15′ and 106° W.

GENERAL.

World. **Scobel.**

Handels-Atlas zur Verkehrs- und Wirtschaftsgeographie. Für Handelshochschulen, Kaufmännische, gewerbliche und landwirtschaftliche Lehranstalten, sowie für Kaufleute und Nationalökonomen. Herausgegeben von A. Scobel. Bielefeld und Leipzig: Velhagen & Klasing, 1902. *Price 5m. 50 pf. Presented by the Publishers.*

This little commercial atlas contains altogether forty pages of maps, plans, and diagrams, having reference to all the important branches of commercial geography. The maps are clearly drawn and carefully printed in colours. They are not overcrowded, and the main object of each and the special features it is intended to illustrate are clearly brought out. Notwithstanding the small scale of the maps, a great deal of information is given, although of a very general character. Amongst those deserving special notice are the maps showing the distribution of minerals, useful plants, and wild and domestic animals. As might be expected, being a German atlas, there are many more maps of Germany than of any other country.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during May and June, 1902. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
3227 to 3238		Atlas of monthly wind charts for coasts of South America. 7*s.*
1344		North Atlantic. Tidal streams amongst the Færoe islands. 1*s.* 6*d.*
3258 m =	6·88	England, east coast:—River Tyne, Jarrow Slake to Elswick. 1*s.* 6*d.*
2669 m =	0·5	The Channel islands and adjacent coast of France. 3*s.*
2644 m =	0·5	France, north coast:—Ile d'Ouessant to Plateau des Roches Douvres. 3*s.*
3264 m =	3·0	Newfoundland, south coast:—St. Mary's harbour and adjacent approaches. 2*s.*
3263 m =	3·0	Newfoundland, south coast:—Salmonier river and Colinet harbour. 2*s.* 6*d.*
3266 m =	2·96	Newfoundland, south coast:—Long harbour and St. Croix bay and adjacent anchorages. 1*s.* 6*d.*
3257 m =	0·8	Canada. Lake Huron:—Chantry island to Cove island. 3*s.*
3253 m =	var.	South America, west coast:—Plans on the Coast of Chile. 1*s.* 6*d.*
3268 m =	7·1	Central America, west coast:—Panama road. 2*s.* 6*d.*
3271 m =	3·98 5·97	Vancouver island and British Columbia. Plans in Broughton and Johnstone straits:—Alert and Blinkinsop bays. 1*s.* 6*d.*
625 m =	0·4	Africa, west coast:—River Congo. 1*s.* 6*d.*
3252 m =	0·25	Central Africa:—Victoria Nyanza (northern portion). 2*s.* 6*d.*
3255 m =	6·0	Central Africa. Victoria Nyanza:—Entebbe bay. 1*s.* 6*d.*
3256 m =	6·9	Central Africa. Victoria Nyanza:—Port Florence. 1*s.* 6*d.*
3267 m =	3·74 4·0	Plans on the west coast of India:—St. Mary isles, Mangalore harbour. 1*s.* 6*d.*
976 m =	2·9	Philippine islands:—Manila bay. Plan added: port of Manila.
3283 m =	2·0 6·0	Philippine islands, west coast:—Ports Salomague and Sual. 1*s.* 6*d.*
3274 m =	0·2	China. Upper Yang tse kiang. Tung ting lake and Siang river. 2*s.* 6*d.*
3224 m =	1·62	Japan, Kiusiu, north coast:—Iki island. 2*s.* 6*d.*
1596		Harbours and anchorages on the coast of Italy. Plans added:—Port Salerno, Port Torre del Greco.
1292		South America, east coast. Plan added:—Atlas anchorage.
632		Africa, west coast. New plan:—Angra Pequeña.
934		Eastern archipelago. New plan:—Ketapang bay.
3131		Anchorages in New Hebrides islands. Plans added:—Talomaco and De la table anchorages. Requin bay.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
2669 *a*, *b*	Channel islands, and adjacent coast of France, two sheets.	New chart. Channel islands and adjacent coast of France (one sheet)	2669
2644	Ile d'Ouessant to les Sept Iles.	Ile d'Ouesssant to Plateau des Roches Douvres	2644
1287	Chañaral, Choros and Apolillado bays. Plans on this sheet.	Choros and Chañaral bays and Apolillado cove, on new sheet	3253
2261	Panama roadstead. Plan on this sheet.	New plan. Panama road	3268
1544	Naos anchorage. Plan on this sheet.		

No.		Cancelled by	No.
2067	Alert bay and entrance of Nimpkish river on this sheet.	New plan on sheet	3271
625	River Congo from the entrance to Matadi. Plan: Turtle cove.	River Congo, from the entrance to Matadi .	625
746	Mangalore or Kodyal Bandar. Plan on this sheet.	New plan on sheet	3267
2454	Plan of port Sual on this sheet.	New plan. Port Sual on sheet	3283
1115	Tung ting lake. Plan on this chart.	New plan. Tung ting lake and Siang river	3274

Charts that have received Important Corrections.

No. 2793, England, south coast:—Cowes harbour. 3129, White sea:—Yugorski strait. 2297, Baltic sea, Gulf of Bothnia, sheet 2:—Hango head to South Quarken. 2298, Baltic sea, Gulf of Bothnia:—Nystad light to Stor Fiärd. 185, Germany, north coast:—Port Swinemünde and approaches to Stettin. 1506, France, south coast:—Port and roadstead of port Vendres. 2471, United States, east coast:—New London harbour. 2854, Harbours in the Gulf of Mexico:—Vera Cruz. 1938, South America, east coast:—River Uruguay. 553, South America, east coast:—Cape Dos Bahias to Tova island. 2885, United States, west coast:—San Diego bay, etc. 2839, United States, west coast:—Columbia river. 1456, Africa, west coast:—River Cameroon with Ambas islands. 705, Madagascar:—Pasindava bay to Nosi Shaba. 746, India, west coast, sheet 9:—Mulki to Mount Dilli. 69, Ceylon:—Pambam pass. 755, Bay of Bengal:—False point anchorage, etc. 942A, Eastern archipelago, eastern portion, including Flores, Banda, and Arafura seas. 2636, Philippine islands:—Strait of Makassar, north part. 1258, Korea:—Approaches to Séoul, etc. 532, Japan:—Simonoseki strait. 1041, Kamchatka:—Avatcha, outer bay. 1670B, Australia, east coast:—Moreton bay, sheet 2. 2422, Australia:—Torres strait, north-east and east entrances, with outlying reefs.

(*J. D. Potter, Agent.*)

Chile. **Oficina Hidrografica, Valparaiso.**

Golfo de Quetalmahue, Bahia de Ancud, y Canal de Chacao (No. 93). Scale 1 : 100,000 or 1·5 stat. mile to an inch. Oficina Hidrografica, Marina de Chile, Valparaiso. *Presented by the Director de la Oficina Hidrografica, Valparaiso.*

North Atlantic Ocean and Mediterranean Sea. **Meteorological Office, London.**

Pilot Chart of the North Atlantic and Mediterranean for August, 1902. London: Meteorological Office. *Price 6d. Presented by the Meteorological Office, London.*

United States Charts. **United States Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for July, and of the Pacific for August, 1902. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

North-East Africa. **Bright.**

Seventy-five Photographs of Egypt and the country between the Upper Nile and Southern Abyssinia. Taken by Major R. G. T. Bright, C.M.G. *Presented by Major R. G. T. Bright, C.M.G.*

These photographs supplement those previously presented by Major Bright, which were noticed in the *Geographical Journal* for August, 1901, and were also taken by him during his journey from the Upper Nile to the frontier of Southern Abyssinia in 1899. As will be seen by the titles, some of the subjects are of considerable interest. It is greatly to be regretted that the photographs taken by Major Bright on his recent and more extended journey in this part of Central Africa were all lost, owing to the great difficulties of transport and privations which he and his leader, Major Austin, met with upon the latter part of their journey.

(1) The palace, Khartum; (2) Khalifa's house, Omdurman; (3) A house in the Khalifa's harem; (4) House of Khalifa's head wife, Omdurman; (5) Mahdi's tomb, Omdurman; (6) Sudanese native officer and interpreter; (7) Sudanese soldiers from Latuka; (8) Sudanese soldiers from Latuka (non-commissioned officers); (9) Group

The

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FROM THE SOMALI COAST THROUGH SOUTHERN ETHIOPIA TO THE SUDAN.*

By OSCAR NEUMANN.

In the spring of 1899 Baron Carlo von Erlanger asked me to join an expedition to Somaliland, which he intended to undertake for the sake of sport and ornithological research. I agreed on condition that the journey should not be confined to Somaliland, but should also extend to the countries of Southern Ethiopia. The preparations took nearly half a year. Meanwhile the revolt of the mad Mulla had broken out, and the western route proposed by myself proved to be the only one possible, as the Foreign Office was forced to recall its permission to penetrate the hinterland of Berbera, and we were therefore obliged to set out from Zeila by the old caravan route to Harar. The members of the expedition were Baron Carlo von Erlanger, Dr. Hans Ellenbeck as physician, Mr. Johann Holtermuller as cartographer, Mr. Carl Hilgert as taxidermist, and myself.

We started from Zeila on January 12, 1900, but an accident to Mr. Carl Hilgert, who nearly killed himself with a small flaubert gun, stopped us at the wells of Dadab, only three marches from the coast, so that we did not arrive at Harar until the beginning of March.

In the desert Baron Erlanger and myself preceded the caravan in order to meet Mr. Alfred Ilg, the foreign minister of the Emperor Menelik, who was on his way to the coast, and to whose valuable help a great part of the success of our expedition is due. But in the first place we have to thank the Emperor Menelik, that intelligent ruler and restorer of an ancient and great empire, for his help and permission to pass through his country. In the second place our thanks are due for the kind assistance afforded by Major (now Lieut.-Colonel) Harrington, H.B.M., Agent in Abyssinia, Major Ciccadicola, the Italian envoy, and Mr. Muhle, postmaster and chief engineer of the telegraph and telephone lines between Adis Abeba and Harar.

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* Read at the Royal Geographical Society, June 9, 1902. Map, p. 480.

From Harar we made an excursion to the mountains of Gara Mulata, situated about three days to the south-west, and not visited by any European since the time of Captain Hunter. The western slopes of this range are covered with thick forest, and therefore the fauna, as well as the flora, here contrast sharply with that which we had found in the dry Somali desert between Zeila and Jildesa, situated at the foot of the Harar mountains. Returning to Harar, the first thing we found was a prohibition to continue our journey to the south, as the countries of the Ennia and Arussi Galla were said to be in a state of rebellion, excited by that of the Somal; and only after a solemn declaration on our part to the effect that the Emperor Menelik should not be held responsible for our safety, and thanks to the great assistance of Major Harrington, did we receive permission to continue our journey. Unfortunately, we were again obliged to put off our departure, as a great many of our camels, which during our sojourn in Harar had been left at a place in the Erer valley, had died there from the results of eating poisonous herbs, and it was impossible to obtain new animals for some time. We therefore made a temporary camp at Gandakore, in the country of Argobba to the south of Harar.

It is remarkable that, in spite of their proximity to Harar, next to nothing was known of the interesting Argobba people and their old stone buildings. The remains of this probably once powerful nation dwell on the eastern slopes of the Hakim, a mountain ridge situated to the south of Harar. Their houses were built of stone, had high watch-towers in the centre, and were surrounded by strong walls; they are now mostly fallen into decay, and are only partly inhabited. The old ruins overlooking the Erer valley resemble mediæval castles, and present a picturesque appearance. Scattered amongst them are the straw huts of the Ala Galla, who form the greater part of the population of to-day. Mysterious reports as to the Argobba exist among the Harari and the Galla; it is said that at certain festivals they devour human flesh. It is certain that these reports are untrue, as the Argobba are strict, even fanatical Mohammedans, but they seem to prove that the nation is of quite a different origin to the inhabitants of Harar.

On May 22 we set off southwards from Gandakore, and on the next day we passed the village of Biaworaba. The Austrian explorer Paulitschke had pushed as far as this place in the year 1884, but since that time no European had reached it or explored further south, as the Abyssinian Government had strictly forbidden any European to enter that country. South of Biaworaba we entered the country of the Ennia. This people is a mixed race of Galla and Somal; they speak a Galla dialect, but have followed the nomadic manner of living of the Somal. For one or two years they build for themselves square huts of cow-dung, much resembling those I found, during my journey in East Africa, in use by the sedentary Masai, the so-called Wakwafi. Besides these, they build for their cows and sheep peculiar huts, 7 to 8 feet high, resembling a sugar-loaf, likewise of cow-dung. Sometimes, but seldom, they cultivate small tracts of land. These people are rather poor, and they are therefore mostly left in peace by the Abyssinians. At the time of our visit they were in extremely poor circumstances, as different parties of the Ogaden Somal had crossed the river Erer some months before, and had carried off many of their cattle. On the whole, the country is a high plateau, thickly grown with bush and intersected by two tributaries of the Wabbi, the Gobele, and the Moyo, which have cut deep cañon-like clefts in the tableland. On the banks of the Moyo we found some beautiful grottoes, and I must also mention the remains of some old towns which we passed during this part of the journey. Here was formerly situated the Ethiopian frontier province of Daroli, which was devastated in the year 1528 by Mohammed Granye, the Sultan of Tajura, the "Attila of Africa," as he has been called. I must also note, at this point, that the river Shenon, marked on former maps, was not to be found, and was not even known by name to the Eonia people. And further, we discovered at several places between Harar and the Wabbi—especially near Harrorufa and Achabo—

BASALT ROCKS NEAR LASMAN, BRITISH SOMALILAND.

strata of Jurassic age containing numerous fossils mostly in a splendid condition. On June 10 we were able to cross the river called Wabbi by the Galla, but better known by the Somali name Webi Shebeli, that is to say, the Leopard river.

On the further bank of the Wabbi an event occurred which might have proved fatal to the success of our expedition. Our Somal, or a great part of them, had made up their minds to strike, as they feared our expedition would keep them too long from home. Perhaps they intended to go straight east and to join the revolting Ogaden tribes. By good luck I arrived just in time to stop the party from crossing the river with their rifles. They were afraid to return without them, and so, after a day's consultation, they agreed to go farther west with us. We were now in the country of the Arussi, a large and once much-feared section of the Galla tribe. Near a place called Gurgura we struck the route of Dr. Donaldson Smith, the first explorer of these countries, and followed it as far as the holy Mohammedan town of Sheikh Husein. Here, on the southern banks of the Wabbi, the bush was not so dense as on the north, and game was in some places abundant. We often found the fresh tracks of elephants, and near a place called Luku there were large herds of zebra (*Equus grevyi*), oryx and "gerenuk" (*Lithocranius Sclateri*), and plenty of the lesser kudu. The town of Sheikh Husein is well known from the wonderful description given in Dr. Donaldson Smith's book. When you approach it, you already see from afar the white tombs of the sheikhs glistening in the sun. There are about twelve tombs altogether. In the middle there is a cemetery, containing the tomb of the Mohammedan saint who is said to have founded the town, and whose name it bears. The inhabitants tell many stories of the miracles he did: for instance, he is said to have piled up in one night a small mountain situated south-east of the town. The faces of the inhabitants show clearly that they are descended from old Arab colonists. Their chief is the Imam, a direct descendant of Sheikh Husein. The Christian Abyssinians, who for about ten or twelve years have been masters of these countries, treat the Mohammedans here, and their traditions, with much respect. Everything in and near Sheikh Husein is holy, and belongs to the dead Sheikh. It is not permitted to cut wood near the town, no cattle are sold, and we were asked not to shoot birds. One of my Somal having caught two bats with a butterfly net in the holy tomb, a large assembly was held, and the poor fellow and myself were cursed by the Imam, until I gave him some dollars to appease the wrath of the dead sheikh. I will simply mention that, besides the tombs, there are other stone buildings in Sheikh Husein, which, in my opinion, are perhaps of a pre-Islamatic origin, such as a wall about 2 feet thick surrounding a small lake near the town.

Prior to our arrival we had received messages from the Abyssinian dejasmach (General of the Centre), Wolde Gabriel, the governor of these countries, ordering us, in the name of the Emperor Menelik, to proceed straight to Adis Abeba. Meanwhile, we had lost so many camels by the rough roads in the Ennia and Arussi lands, that we were compelled to leave here about half our stores. Directly west of Sheikh Husein there was no road practicable for camels, so we had to proceed two days in a south-westerly direction, crossing the beautiful and forest-clad chain which Dr. Donaldson Smith has called the Gillet mountains. The forests here show nothing of the character of a tropical African forest. Looking at the tall fir-like juniper trees, among which, in some places, the barley-fields of the Arussi are scattered, the traveller might imagine himself in the Black Forest or in the forests of Tyrol. West of the Gillet mountains is an isolated mountain called Abunas, or Gara Daj, by the Arussi, which we ascended after some quarrels with the Abyssinian chief whom Wolde Gabriel had sent us as escort. This fellow seemed to be afraid that we might run away on the other side of the mountain. On the top of the Abunas there are ruins of a sanctum probably of pre-Islamitic age. The view here is splendid, and boundless on every side except the north, where Mount Abulkassim, about 900 feet higher than Abunas, is situated. From the summit we descended to the Wabbi, recrossed the river to the north, and camped about halfway up Mount Abulkassim, the holy mountain of the inhabitants of Sheikh Husein.

GROTTOES ON THE MOYO RIVER.

This mountain, already seen from a very far distance fifteen years ago by the Italian explorer Ragazzi, had never before been visited by any European. There is a good way leading upwards to a high precipice, in which are about a dozen caverns, at some seasons of the year inhabited by Mohammedan pilgrims. In one of these we found a stool, a mortar with pestle, and a wooden pillow. Not far off is the grave of Sheikh Abulkassim, a descendant of Sheikh Husein, made in an artificial bower situated in a wonderful tropical forest full of lianas and palms. The grave is covered with glass beads and ornaments of copper and brass. Similar ornaments are also to be seen on some trees in the forest, and no visitor would dare touch these holy objects. Round the mountain there is no settlement whatever.

From Abulkassim, we proceeded west for about three days on the hills situated on the northern bank of the Wabbi. Near a place called Jaffa we were stopped by a large body of Abyssinians sent by the dejasmach Lulsagit, through whose countries we had now to pass. It took us some trouble to get permission to proceed farther, as the dejasmach had had no notice of our arrival. Here we had to ascend the last step of the plateau, and found ourselves on a large grass-covered expanse, absolutely flat and without any trees, called Didda by the inhabitants. On old maps this plain is called the Arussi plateau. The North-Western Arussi, who live here, are a pure Galla tribe, showing no mixture of Arab blood, as do the inhabitants of the Sheikh Husein district. The sight of these dirty, long-bearded men galloping their small ponies, covered with brass and iron rings, over the wide plain, reminds one of Mongolian or Tartar tribes, rather than of an African people. Their huts are scattered in small groups of three to five all over the plain. They do not cultivate much ground, but have large herds of fine cattle. Just as we arrived here the rainy season broke out with terrible vehemence, and the plain was soon changed into a large swamp, so that we here lost nearly half our camels. The crossing of this plain took us twelve days, after which we descended into the valley of the Hawash, which had overflowed its banks, and in some places changed the valley into a large lake. I will here mention the church Georgis, in the district Sire, which was formerly a Mohammedan mosque, but is now changed into a Christian church by the Abyssinians. It might have been supposed that the country between the Hawash and the Abyssinian capital was absolutely known, as many explorers, including the Italians Traversi and Ragazzi and the German Stecker, had visited it. We were all the more surprised to find here a magnificent waterfall unknown before. The river Modsho, a small northern affluent of the Hawash, which is here about 500 feet broad, falls over a precipice 40 feet in height. We called this waterfall, which I consider to be one of the most beautiful in North-Eastern Africa, Menelik falls. Passing by Lake Buchoftu, one of a group of five small crater lakes called the Adda lakes, we arrived in Adis Abeba on August 14.

The Emperor Menelik promised us free permission to travel in his countries, and any assistance we might require. Owing to the fact that our journey from Zeila to Adis Abeba had taken us nearly double the time we had at first calculated, Baron Erlanger and I came to the conclusion that it was impossible for us to accomplish together all our proposed programme. We therefore decided to divide our caravan, in order to explore as large an extent of unknown ground as possible. Baron Erlanger proposed to return by another route to Sheikh Husein, and to strike thence to Lake Rudolf by a new route, while I made up my mind to first penetrate the highlands of Shoa proper, and afterwards to find a new route somewhere westward to the Sudan.

For the moment travelling was out of the question, it being the height of the rainy season; but as soon as the rain began to slacken, I formed a small caravan and started for that unknown part of Shoa which lies between the rivers Guder and Muger, two large southern affluents of the Blue Nile. Two days from Adis Abeba I passed the place Ejere, then a small village, but soon to become the new residence of the Emperor Menelik under the name of Adis Halem—that is to say, the "new world," the scarcity of wood near the old capital Adis Abeba ("new flower") becoming each year more and more apparent. Near Ejere, and still more in the district of Cheracha, there are magnificent large forests. After passing these I came to the district of Kollu, and stopped some days near a village called Aveve, as the place was noted

MENELIK FALLS.

for the presence of lions. I found some fresh tracks, but did not get a chance of seeing one. Here I found the source of four small rivers not previously known, the Urga, Gora, Taranta, and Bussiyo, which afterwards unite under the name Taranta to form a rather large river, which then flows westward to the Guder. The Bussiyo forms the frontier between Kollu, belonging to Shoa proper and the province of Gindeberat, which belongs to Gojam, the land of the since deceased king Tekla Haimanot. I will here mention the interesting basalt mountain called Badattino, on the top of which there are a village and a church. From here to Abuye, an Abyssinian fort situated on the edge of the plateau, the country has the character of a beautiful English park. I had to leave the bulk of my caravan at Abuye, as the road thence down to the Blue Nile was not practicable for fully laden mules, and descended with only seven men and a small tent. The difference in height between Abuye and the Blue Nile is about 5800 feet. The river was now in flood and turbulent, making it quite impossible to cross to Gojam. Great heat prevailed in the valley, and we were terribly bitten by mosquitoes. I therefore gave quinine to all my men, and it was interesting to find that one who refused to take it, got an attack of malaria after six days. Having reascended the plateau, I returned by the same way to Badattino, and thence took another route straight eastwards.

Near a village called Adaberga, I arrived to witness the end of a religious ceremony of the Galla. The Galla are split up into some large divisions, and these again into smaller tribes, which are at the same time religious communities. Each of these tribes has its high priest, or Gallan, who resides near a sacred grove. On certain days of the year the Gallan shuts himself up in his house, and, after working himself into a state of ecstasy, makes inspired communications to the people standing round. The Christian Abyssinians are forbidden by their priests to attend these ceremonies; nevertheless, they believe in the mysterious power of the Gallan, whom they hold to be in league with the devil. The Gallan here was an interesting-looking man standing over 6 feet high, with long hair and beard. From Adaberga I went to Falle, a place given by the Emperor Menelik to Mr. Ilg, and here I stopped some days to observe and collect specimens of the black Jellada baboon, a species not previously met with, which lives on the rocks of the steep precipices leading to the Muger river. After four weeks' absence I returned to Adis Abeba, and now prepared for my expedition to the Sudan.

The route I chose did not lead directly westward, because the chain of lakes situated in the northern part of the great East African rift-valley seemed to offer some interesting geographical problems, as the existing maps on that part published by the Italians Traversi and Bòttego, by the Frenchman D'Aragon, by Donaldson Smith, by the late Captain Wellby, and a new one published by Count Leontieff, which came into my hands just before starting from Adis Abeba, could not be brought into agreement with each other. By the different position assigned on these maps to the lakes situated between Lake Zwaj and the large Lake Abaya, called Lake Margarita by Bòttego, I calculated that there ought to be one or even two lakes in that region not yet known. This calculation was afterwards confirmed by the discovering of Lake Langanna or Korre and the double Lake Abasi.

I left Adis Abeba on November 14, and at Mount Zekwala met the caravan of Baron Erlanger, who had started some days previously. The Hawash was now so low that we easily marched through it. From here to Lake Zwaj the country is covered with typical acacia bush, in the middle of which I found the grass and moss-covered ruins of an old Abyssinian settlement. Round Lake Zwaj, and on down the whole of the rift-valley, as far as I followed it, game was plentiful. On the hills and mountains bordering the valley we have the large kudu, while farther south, at Lake Abaya, there is the lesser kudu. We saw on the plains the East African zebra (*Equus granti*), hartebeest (*Bubalis swaynei*), and Grant's gazelle, in the forests elephants and rhinos. The reeds bordering the lakes are inhabited by large herds of water-buck and reed-buck.

FIRST VIEW OF THE BLUE NILE NEAR ABUYE.

The region near Lake Zwaj is very interesting from a geological point of view. We are here at the northern end of the great East African rift-valley, which extends south to the middle of German East

Africa, finishing near Mount Gurui. The mountains bordering the valley at this northern part consist mostly of obsidian and other volcanic vitrified rocks. Some smaller rocky hills standing out in some parts of the valley also consist of the same material. The river Suksuk joins Lake Zwaj with the more southernly situated Hora Shale. Lake Hora, as it was called by the late Captain Wellby, is wrong, for Hora means "Salt Lake;" Hora Shale, "Pelican Salt Lake." South of it is the Hora Lamina, the water of which, as we were told by the Galla, has the same salty properties as has the Hora Shale. There is only a small neck of land between these two lakes, in the middle of which lies Mount Fike, a volcano of the typical horseshoe form, with its opening turned northwards. South-east of Lake Zwaj lies the Alutu, a mountain which consists in its upper parts almost entirely of a greenish-black obsidian-like rock. I made the ascent, and saw from the top, east of Hora Shale, a lake previously unknown, which was called by the Arussi who accompanied us Hora Langanna, or Hora Korre. This is the most beautiful of the lakes, as the southern slopes of Mount Alutu fall in picturesque contour into the water. There is a connection between this lake and Hora Shale, which is called Daka by the Arussi. I reached the Hora Korre on the next day; its waters are only slightly brackish. South of Hora Korre I found the most magnificent euphorbia forests I ever saw in Africa. Near a great market-place called Alelu I marched for about five or six hours, hardly seeing any other tree. Arriving at Lake Abassi, which, although seen by d'Aragon, is not to be found on any recent map, probably because it was considered identical with the Lake Lamina of Captain Wellby's, my caravan and that of Baron Erlanger were stopped by the Balambaras Abite, a sub-chief of the Dejasmach Balcha, the Abyssinian governor of these countries. In spite of the permission given in the Emperor Menelik's letters, we had to send messengers ahead to the dejasmach, in order to ask his permission to come to his residence. It took them five days to return. I used that time in making investigations of the hot springs, which are situated at the eastern corner of the lake. Some of these had formed hills of tuff 10 feet high. The substance is about the same as that of the Karlsbad-Sprudelstein. The hot water bubbles out at the summit.

Here we entered a new ethnological region, that of the Sidamo people. The Sidamo form one group, with the Jamjam, Walamo, Borodda, Kosha and Malo people on the banks of the Omo river. This is a group of a probably very remote origin, but more or less mixed with conquering Galla tribes. Ascending from the north, we had to pass wonderful forests covering the western slopes of a high mountain chain, till we reached the plateau covered with alpine marsh and bamboo forest, on which Abera, the "Katama," or residence of the Dejasmach Balcha, is situated. Abera lies about 10,000 feet above the sea-level, and is three hours north of the old capital Daressa, visited by D'Arragon. Looking northward, one has good views back as far as Lake Abassi; looking westward, you have glorious views of Lake Abaya or Margarita, with the mountainous countries of Walamo, Borodda and Gamo on its western shore.

The reception the dejasmach had prepared for us was most magnificent. Hundreds of horsemen dressed picturesquely came out to meet us. Between our camp and the bamboo palace of the dejasmach there was a double line of Abyssinian warriors in full attire, dressed with silk skirts interwoven with gold or silver, or covered with lion and leopard skins. Hundreds of shields, covered with gold and silver ornaments, glistened in the sun. The dejasmach wished us to continue our journey by the great Abyssinian road running south along the ridge of this large mountain chain, but I intended to descend to Lake Abaya, in order to have some shooting, and to visit one of the large islands in the lake. It was long before the dejasmach would give permission for this. He told us dreadful stories of the bad roads, the absence of food near the lake, and the number of people killed by lions there. The reason for these stories probably was that he was afraid that we would shoot too many elephants, of which we afterwards found large herds on the shore of the lake. Descending, I passed the country of the Gudji, or Uata Dera, who in their physiognomy reminded me very much of the Wandorobo tribe of East Africa.

THE SUKSUK RIVER.

Quite a different population called Gidicho lives on the largest island of the lake. The Gidicho have good-looking, Somali-like faces. My Somal found, to their great astonishment, that a great part of the Gidicho expressions were almost identical with their own, as, for instance, the words for the various parts of the body and for the best-known animals, such as lion and leopard. I consider this discovery to be of great importance from an ethnological point of view, as the Somal were always thought to be the last intruders in North-East Africa, and here we find an isolated tribe surrounded by a population of an apparently older origin. The boats of the Gidicho are very interesting. They are rather rafts in boat form, being made of the very light wood of a species of ambach. The bow is often ornamented like that of the Venetian gondolas. Formerly there were constant quarrels and wars between the inhabitants of the islands and those of the shore, but now, under Abyssinian rule, all live in peace with each other.

At Lake Abaya my caravan separated from that of Baron Erlanger, who had to return to Abera and Sheikh Husein. South of Lake Abaya lies Lake Ganjule, whose water has a wonderful dark azure blue colour, and may be compared to the most beautiful lakes of Switzerland. I had resolved to pass along the eastern shore of Lake Ganjule, in order to solve the problem of the sources of the river Sagan, the largest affluent of Lake Stefanie, which was supposed to flow out of Lake Ganjule. This I found to be not the case. The sources of the Sagan lie east of the south end of Lake Abaya. But there is a broad channel connecting Lake Ganjule with the Sagan. The bed of this channel was dry at the time, but there were some large and small water-pools scattered over it. When the water rises in Lake Ganjule for about 5 inches, which will probably take place every year at the beginning of the rainy season, a large river will run from Lake Ganjule to the Sagan. On the upper Sagan I again found some hot sulphurous springs. It was impossible to follow the course of the Sagan, as it runs at some places through densest forest, the haunt of rhinos and buffaloes, the tracks of which were to be seen everywhere. I went round the south corner of the lake and ascended the mountains of Gardulla, where I reached in the second week of January, 1901.

The Gardulla were the first people of Bantu stock that I met. The difference can be seen at first glance in their heavier and stronger built figures and their nearly black skin. Whilst working in the fields the men go quite naked; in the villages they wear skins and cotton stuffs. Cotton is the principal cultivation of Gardulla and of most countries northwards to Kosha and Konta, while further north Kaffa and Jimma are the first coffee-lands of Africa. As the hills of Gardulla are very stony, the inhabitants range the stones in terraces, so that a Gardulla hill has the aspect of a vineyard on the Rhine. They have their houses and the walls surrounding them made of broad, plain planks, and on the top of the reed roof there is as ornament a red earthenware vase. The land was formerly under a queen, who still lives in a place called Gidole. The Abyssinians still allow her to exercise her authority in petty affairs, but she has no further influence whatever. The true ruler of the land, the Futarari Wolde, is a sub-chief of Futarari Afta Georgis, to whom the Emperor Menelik gave these countries when conquered, but who prefers to remain in Adis Abeba. The Gardulla wear broad necklaces of brass or copper. The women wear bracelets, necklets, and rings round fingers and toes, made of small red and blue beads. In Gardulla I saw the first camels since my departure from Adis Abeba. Futarari Wolde has a large herd of these animals, obtained from the countries of the Borana and Tertale near Lake Stefanie, which are kept in a place at the foot of the mountains. Westward of Gardulla there is a large uninhabited plain, called by the Abyssinians, "Adoshebaï."

BOAT OF THE GIDITSCHO, ON LAKE ABAYA.

The spirit Adoshebaï of the Abyssinians combines the qualities of a devil and patron saint of the hunters. They call upon Adoshebaï when they have killed a lion, elephant, rhino, giraffe, or buffalo, and even a poor Shankala, that is to say, any of their large game. I may here mention that the Abyssinians call Shankala not only the tribe called Beni Shongul by the Arabs, living on the western banks of the river Dabus, but all the Sudanese and black people living in the countries round Lake Rudolf and near the Omo. That is all dark-coloured people with the exception of the Somal and the Galla.

There is a legend that, when the Abyssinians conquered this country about seven years ago, two elephant-hunters were descending from the "Katama" Gardulla to the large plain to the west. They had the luck to kill one of the large pachyderms near a small hill, and called on their patron saint, when suddenly the hill began to dance and sing, "Adoshebaï, Adoshebaï." So they now look upon the plain as the home of this spirit. The Abyssinians had also told me of a dangerous disease, which would kill all our mules and horses, by which this plain is haunted. Nevertheless, I determined to cross it, as otherwise I should have had to follow hence, as far as the Omo, the route taken by Captain Bòttego. But I marched straight on without spending much time in hunting the game, which was abundant here. Elephants, rhinos, buffaloes, large herds of zebras and hartebeests of a species new to science, were seen. In the night we were disturbed by the roaring of the lion.

After two days' marching we came to a river called Shambala by the Abyssinians of our escort. On the other side we saw natives running away from their cotton-fields in terrible fright. We were here in the country of the Male, which may be identical with the Mela mentioned by Donaldson Smith. The Male are not yet absolutely subjected by the Abyssinians. I gave presents to some old men and women, who were not quick enough to run away, and sent them back to their fellows, but I was not able to have any intercourse with the people, as the next day nobody appeared. Here I found, for the first time, bows and poisoned arrows, while in all the countries passed before the spear and sword were the only arms. Crossing the Barsa, another river flowing, like the Shambala, into Lake Stefanie, we came to Uba, a part of the equatorial province given by the Emperor Menelik to the Abyssinian count and dejasmach Leontieff. There is a good fort in Uba, built by the brothers Seljan, now officers of Count Leontieff, formerly musicians and professional pedestrians. Neither of the two brothers were here, as they were recalled to Adis Abeba by the emperor, on account of some differences they had had with the natives.

In Uba the illness which the Abyssinians had feared in the plain of Adoshebaï broke out amongst the mules. I had thought before that it might be the tsetse fly disease, but it now became clear that it was the glanders. This disease seems to be endemic on all the northern affluents of Lake Stefanie, as is shown by the experience of the late Captain Wellby, who lost most of his animals after passing the same region. I descended into the beautiful valley of the river Zenti, covered with thick forest and magnificent palm trees, which separates Uba from Gofa. The Zenti runs northward into the Omo.

Every day more of my mules and horses became afflicted with the disease, and many of them died. The representative of Dejasmach Lamma, the Governor of Gofa, who was at the time in Adis Abeba, sent me native porters, who helped me to carry the baggage up the mountains of Gofa, which reach an altitude of about 10,000 feet above sea-level. At a place called Gadat, near the capital Jala, I stopped for two weeks, and, in order to master the disease, isolated the sick animals and divided the others into small bodies. After that time I had saved about twenty-five out of sixty. Meanwhile I had sent my Abyssinian headman with a small escort to Adis Abeba with orders to buy new mules and horses there, and to come back as quickly as possible to Anderacha, the capital of Kaffa, which I had designed to be my starting-point for the unknown lands in the west. From Gofa to Kaffa the expedition went on very slowly, because I was now dependent on native porters, whom I got by order of the Abyssinian governors from the smaller native chiefs, and who had to be changed when we came into the land of another chief, which was always after one or two days' short march. Crossing the rather bare valley of the Ergino, another affluent of the Omo, I came to the country of Doko.

LANDSCAPE IN GARDULLA.

The Uba and the Gofa, through whose countries I had passed, until here belong to the Wallamo tribe. The Doko are typical Bantu, and seem to be nearly related to the Gardulla. The men walk about absolutely naked; the women wear an apron made of cut banana leaves. They know how to weave cotton stuffs well, but seldom use them themselves. North of Doko is the country of Malo, inhabited by a Wallamo tribe. Hence I descended to the Omo, which I managed to cross within two days, on rafts resting on inflated goatskins. In this region there is not much forest on the shores of the river, as the banks consist of gigantic gneiss blocks. At no place in Africa have I seen so many hippos as here. Walking down the banks, I saw in half an hour more than a hundred heads appearing above the surface of the water. Every stony bank in the river was occupied by a family of these clumsy animals. They are not hunted here, and therefore not at all shy.

North of the river lies the country of Kosha. Kosha and the neighbouring Konta are the only provinces I found in Abyssinia where the slave-trade is in full swing. At the large weekly markets you can see —besides cotton, coffee, flour, goats, and sheep—children sold in small or large lots. It is probable that this trade is due to the great famine by which these countries have been stricken during the last two or three years, and the children all seem to be quite happy at becoming the property of richer men, with whom they will be better fed. The houses of the Kosha chiefs are very interesting. They are long barn-like structures, about 15 feet high and 50 to 60 feet long, entirely covered in with grass. Here the rainy season was ushered in by terrible tempests, and for the next two months we had thunderstorms nearly every day. Near a place called Dereta we passed the "Kella," or gate of Kaffa.

These South Ethiopian kingdoms Kaffa, Jimma, Gera, and Enarea, of which we have still but an imperfect knowledge from the journeys of the Italian Cecchi and the Frenchmen d'Abbadie and Borreli, are separated from each other by an interesting system of fortification. Where the countries are not bounded by high mountain chains, difficult to cross, they are surrounded by deep ditches and strong fences, which can only be passed by means of a guarded gate called the "Kella." The Abyssinians, after having taken these countries, retained this system of fortification and the custom duties between the different countries. The export of slaves is absolutely forbidden, that of cattle only allowed by permission of the governor. The whole south of Kaffa is one large forest; there is a broad road leading from the Kella to Anderacha, the new capital. It is absolutely impossible to penetrate the forest which borders the road without using axes or bush-knives. Scattered in clearings in the forest are the villages and coffee plantations of the inhabitants, the Kaficho. These are said to be the descendants of the old Ethiopians, who were isolated when Mohammed Granye, Sultan of Tajura, smashed the old Ethiopian empire in the years 1528–43. It is a fact that most of the Kaficho were Christians when the Emperor Menelik conquered Kaffa about five years ago. Also the "Gez," the ecclesiastical language of the Abyssinians, was still in use, but the language used by the Kaficho of to-day has no affinity whatever with the modern Abyssinian. Kaffa was formerly ruled by powerful independent kings, to whom also nearly all the countries west of the Omo were subject. The last king, Savo Teheno, who had submitted some years ago to Menelik, revolted, was defeated by the Abyssinians, and brought as prisoner to the old Abyssinian capital Ankober, where he still lives. Kaffa and all the countries south of the Gojeb and west of the Omo were given to Ras Wolde Georgis, one of the favourites of Menelik. Kaffa was formerly the principal coffee-producing land in Africa, but when the Abyssinians took the country, many of the plantations were destroyed, and it is now inferior in that respect to the kingdom of Jimma. The national dress of the Kaficho formerly consisted of long capes of reed, grass, or hemp. The men wear hats made of goat and colobus monkey skins; the women conical hats of bast. These national costumes are now seldom seen in Kaffa, where the inhabitants dress like the Abyssinians, but they are still exclusively used in the tributary land of Gimirra in the west.

MARKET IN DOKO.

My headman reached Anderacha ten days after my arrival, and brought with him some new men and some mules; but now my most terrible time began. Nearly all the Abyssinians, and also my thirteen Somal, struck and refused to proceed to the unknown countries westward, where, they said, they would all be killed. They went to the Abyssinian chiefs, swearing that they had only been engaged up to Kaffa. The small Abyssinian chiefs (Ras Wolde Georgis and his chief officials being in Adis Abeba at the time) sympathized with my men, as, in spite of the Emperor's permission, they were afraid to let a European go out of the country. Much patience, much money, and many promises were needed to persuade my Somal and about half of my Abyssinians to remain with me. As I was, therefore, in want of new men and also new mules and horses, I had to make an excursion to Jimma, adjoining Kaffa on the north-east, and separated from it by the river Gojeb, an affluent of the Omo. Approaching the Northern Kella of Kaffa, I found everywhere evidences of the last war with the Abyssinians. Near the road I saw strong fences and deep ditches, while the forest was virtually honeycombed with holes about 10 to 12 feet deep, with a pointed stake in the middle of each.

Jimma is almost the richest land of Abyssinia; the inhabitants are pure, well-built Galla; they are nearly all Mohammedans, as well as their king, Aba Jifar, a very clever man, who at the right time submitted to Menelik, and therefore retained his country. King Aba Jifar, who helped the Abyssinians very much in conquering Kaffa, is now in great favour with the emperor. The capital of Jimma is Jiren, the most important market-place in Abyssinia. I estimate that the Thursday market in Jiren is visited by nearly twenty to thirty thousand persons. From all the countries bordering the river Omo, and even from Adis Abeba, and other lands in Southern Ethiopia, the Nagadis or Abyssinian merchants meet in Jiren to sell their wares. All the products of Southern Ethiopia are sold there, in many double rows of stalls about a third of a mile long.

Having enlisted twenty strong men and bought some dozens of mules and horses, I returned to Anderacha, and started thence in the first week of April. Gimirra, which we reached first, is a tributary land to Kaffa; the people seem to be Kaficho, perhaps with a mixture of Nilotic blood. Their old king Chotatu and some of his companions are nearly 6½ feet high. They wear the national dress of Kaffa, already described. The men often wear necklaces, with a string of Hyrax teeth hanging down their chest. In Gimirra is the last Abyssinian post. The people of Binesho, which we passed next, are in friendly relations with the Abyssinians, who will probably soon take possession of the country; the people of Shekho, which lies west of Binesho, are only another branch of the Binesho, but are absolutely independent, and the land is often plundered by Abyssinian razzias.

The Binesho and the Shekho are of the Bantu stock, but are, perhaps, the most interesting tribes I ever met. Their language is hard and sharp sounding. Their figures are broad and muscular; they have different kinds of tattooing on the chest and on the back, but their most interesting tattooing is on the forehead, in which they cut vertical slits, which gives them the aspect of wearing a horn. They often wear capes made out of grass, like those of the Gimirra, and also capes made of cut bark, and, to my great astonishment, I also found clothes woven of bark, similar to those worn in Uganda and Usoga. I never saw a woman, either in Shekho or in Binesho, probably because they are first placed in safety as the object most desired by the Abyssinians. I had to be very much on my guard here, as the Shekho were always lurking in the bushes, trying to cut off my men and kill them singly. Once they speared one of my horses while grazing, nevertheless I succeeded in avoiding any actual fighting.

In Shekho I found a large river running westwards. I believed this river to be the Gelo, discovered near its junction with the Ajuba by the Italian Bòttego, an opinion which was confirmed afterwards. Travelling became very difficult here. The western slopes of the South Ethiopian plateau are cut by many deep ravines; the roads therefore were narrow and bad, and many of my mules became wounded and useless. As it flows westwards, the river Gelo is lined on both sides by the densest forest. I could march only about 2 or 3 miles each day, and to cover that distance the men had mostly to cut the way with axes and bush knives from morning till noon, after which the caravan was able to proceed. The inhabitants of this forest are the Mashango, who were very seldom seen, but we often found large traps made for hippos and water-bucks, and loops made of creepers for monkeys and other small animals going to the water. Already in Gimirra I had seen, far away to the west, a long mountain chain running from north to south, called by the Galla "Gurafarda," that is to say, "horse's ear," from a sharp double peak

OMO RIVER BETWEEN MALO AND KOSHA.

in the middle. It took more than three weeks from Gimirra to reach the point where the Gelo pierces the mountains, forming magnificent cascades. Some days after passing this gap, I saw from a bamboo-covered hill in the west a boundless bush and grass-covered dead flat, the plain of the Sobat and the beginning of the Sudan. Only a few granite hills are scattered over it. Ascending one of these, I saw, far away, a large lake—Lake Tata—through which the river Gelo runs. Here we found the first villages of the Jambo or Anyuak, who were the first true Nilotic people I met. They are a division of the great Shilluk tribe, which is spread over the whole Eastern Sudan, and extends southwards to the east shore of Lake Victoria The few samples I obtained of their language show that it is scarcely distinguishable from that of the Kavirondo people on the east shores of Lake Victoria, whose country I passed on my first African journey in 1894.

The land now became more and more swampy. The Anyuak, poverty stricken through many Abyssinian razzias, live hidden away on small islands in these swamps. A large part of the people have migrated westward, and live in a state of semi-slavery under the protection of the more powerful Nuar near the Egyptian fort of Nasser on the Sobat. Approaching Lake Tata, the swamps became so numerous and deep that I turned south and marched to the Akobo or Ajuba, which river I reached near the village Gneum, where I struck Bòttego's route. The attempt to march along the northern bank of the Akobo failed, because we stuck fast in the swamps, where I lost many of my mules; so, after two days, I marched back to Gneum and crossed the Akobo. The country on the left shore of the river, which had here a northwesterly direction, was drier.

As at that time I had only the maps of Bòttego and Wellby, I concluded that the Akobo of Bòttego and the larger Ruzi of Wellby must be one and the same river. I therefore hoped to get from here to Nasser dryshod, but, instead of turning to the north as I expected, the course of the river after a few days took a due westerly direction, winding in and out over an immense grassy plain. I was now in a very bad plight; my cattle and flour had been a long time exhausted, the country was nearly uninhabited, and game, which had been plentiful on the first days on the river Akobo, became scarce. Glanders had broken out again, and every day more of my animals succumbed. Suddenly I reached the right bank of a slowly flowing river, full of crocodiles. It was now apparent to me that this was the Ruzi of Wellby, or, as it is called by the Nuar, the Pibor. It was impossible to cross the Pibor without boats. So I recrossed the smaller Akobo in the hope that, marching on the right bank of the Pibor, I might find villages with boats. My situation became now desperate; out of sixty-five animals with which I had left Gimirra, I had only thirteen mules, two horses, and two donkeys left.

All the stores not absolutely necessary were thrown into the river, the same was done with all the tents except my own, as well as with my books and clothes ; the only part of my belongings which I contrived to bring safely home being my collections, photographs, diary, and route-books. The day after we had passed the Akobo, I had already dug a hole in which to hide an object which for the moment was only a useless weight—the tusks of an elephant I had shot in the Gurafarda mountains—and I was just looking round my tent to see what more I could dispense with, when suddenly a great tumult arose in the camp. I snatched up my rifle, as I thought an elephant or a giraffe had come near the camp, but my chief Somali jumped in crying, "Marka, Marka." * Abyssinians, Galla, and Somal were screaming, crying, dancing and firing their guns, all looking down the river. There was a steamer in sight, slowly approaching and filling nearly half the river-bed. The Egyptian flag was flying from the mast, and two Europeans stood at the bow. The steamer stopped alongside our camp, and I welcomed the first of the Europeans in English, but on hearing my name he answered me in pure German. It was Sir Rudolf Slatin, and the other gentleman Colonel Bluett, the Mudir of Fashoda. I went on board, and everything was soon explained. Slatin Pasha and Colonel Bluett had come on a journey of inspection to Fort Nasser, on the Sobat, and thence they had had to proceed to a village called Karadong, on the Pibor, in order to settle some quarrels between two

PART OF JIREN MARKET (DJIMMA).

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* "Steamer, Steamer."

influential Nuar chiefs. On arriving here they had heard that a European was approaching with a large caravan, and had decided to steam up the river in order to bring me assistance if required. They had found me when I was just at the last extremity. Had I come two or three days later I should have been forced to make my way to Nasser by land, which would have been a difficult task, considering the diseased state of my mules, and the probable hostility of the Nuar, who had formerly been robbed by the Abyssinian raiders. There are still the ruins of a large Abyssinian fort near the junction of the rivers Akobo and Pibor. As one of my Somal had the day before shot a large bull giraffe, and my men had therefore provisions for four days, Slatin Pasha was kind enough to take me on board, with all my men and my collections. The surviving mules were given to the Nuar of Karadong.

The next day the steamer passed the point where, on the map of this region published by Major Austin in the *Geographical Journal*, 1901, the river Gelo joins the Pibor, but it was apparent that the small river flowing in here could not bring all the waters of the mighty river along which I had marched for four weeks. The Gelo probably divides after having passed Lake Tata; the northern branch, which is possibly the largest, running northward to the Baro, and the southern again dividing into two rivers which flow to the Pibor.

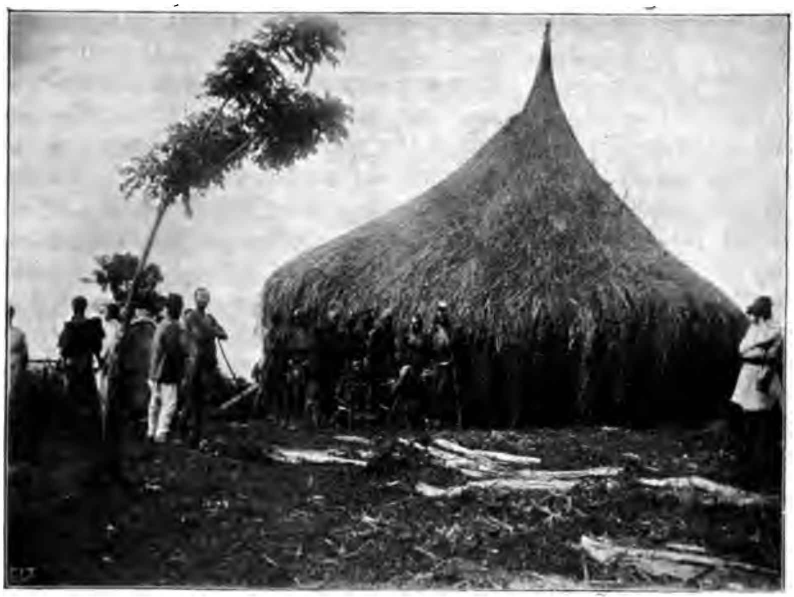
Passing the small Egyptian fort Nasser and the famous Fashoda, one of the sorriest-looking places in Africa, we steamed down to Khartum. Broad green fertile plains alternated with acacia-covered scrub steppes. On the banks of the river we saw villages of the Nuar, the Dinka, and the Shilluk, with their large rounded huts. Everywhere we saw absolutely naked women and men, the latter mostly painted white, boisterously greeting the steamer. There were large herds of cattle, sheep, and goats, and in the Arab districts of the lower White Nile camels, horses, and donkeys. A picture of peace and plenty is the Egyptian Sudan of to-day. We arrived at Khartum on June 15, and I there enjoyed the charming hospitality of the Sirdar, Sir Reginald Wingate. Here, also, I had the pleasure of again seeing Captain Harold, who had given us much help in starting our caravan from Zeila eighteen months before. My Abyssinians were sent by steamer up the Blue Nile to Roseires, in order that they might return thence to Adis Abeba by way of Famaka. My thirteen Somal accompanied me to Cairo, and returned thence to Aden.

I will now give a short review of the purely scientific results of the journey.

From a geographical point of view, it was important to connect the southerly point of Paulitschke's route near Harar with that of Dr. Donaldson Smith, and, further, to bring these into connection with the surveys made by Traversi, Ragazzi, and Stecker in the south of Shoa.

The route I took from Adis Abeba to the Blue Nile passed through country which until then was a blank spot on the maps, as the chief roads from Adis Abeba to Gojam lead to the right of the Muger, or to the left of the Guder. The only map which had hitherto mentioned this district is Fritzsche's map of Dr. Stecker's journey in the Galla countries (*Petermanns Mitteilungen*, 1891), which marked this country as unexplored. Going from Adis Abeba to the south, I chose a route along the east side of the great rift-valley, as the principal road on the western side was already well enough known by the journeys of Captain Wellby and Mr. Harrison.

As I have already mentioned, this resolution was rewarded by the very important elucidation of the lake system between Lake Zwaj and Lake Stefanie, and the discovery of the lake Langanna or Korre. Further, I ascertained that there is no lasting, but only a periodical connection between Ganjule and Stefanie lakes, as the Sagan is not a permanent effluent of Lake Ganjule.



SCHEKHO HUT.

After having carefully surveyed Kaffa and the neighbouring districts (the old maps of Cecchi and Borelli being very incorrect), I ascertained that the watershed between the Omo system and the source region of the Sobat—that is to say, the Nile system—lies on the frontier of Kaffa and Gimirra. The route which I here took lies almost in the middle between the routes of Captain Wellby and Captain Bòttego in the south and those of Bonchamps and Marchand in the north, and leads through a district which until now has been a blank on the map. Of the source rivers of the Sobat, the most northerly, the Baro, is the largest, and must be reckoned as the real head-stream of the Sobat. Then come the Pibor and the Gelo. The Akobo or Ajuba, which, according to Bòttego's maps, was the principal source river of the Sobat, is, in comparison to the three first-named rivers, very insignificant, and is nothing more than a tributary of the Pibor.

As regards the ethnology, we have first the purely Hamitic tribes of the Somali to the north of Harar, and then, after passing the Semitic settlements of Harar and Argobba, the tribes of the Galla to the south. All the countries between Harar and Adis Abeba, as well as the parts of Shoa which I passed through, are inhabited by Galla tribes. The Abyssinians have merely taken possession of the country by subsequent conquest. We first find a purely Abyssinian population to the north of Ankober and in Gojam. In the territory of the lakes and near the Omo we find the interesting tribes of the Walamo and the Sidamo. We come next to the northern extension of the pure Bantu in the tribes of the Gardulla and the Doko; and further westward in the Shuro, the Binesho, and the Shekho. The Kaficho are said to be the descendants of the ancient Ethiopians, but it seems to me somewhat questionable whether they can be connected with the Abyssinians of to-day. After crossing the Gurafarda mountains, we find in the Jambo or Anyuak, and in the Nuar, peoples of pure Nilotic race, the first of which belong to the Shilluk, the second to the Dinka group. I succeeded in bringing with me rich ethnological collections, obtained especially amongst the people living in the lake-chain and the Omo districts, and have also collected specimens of the languages of about ten different tribes.

The geological survey was started south of Harar. I found in many places as far as the Wabbi, especially near Harro Rufa and Achabo, strata which, according to the numerous and mostly very beautifully preserved fossils they contain, must belong to the upper Jurassic formation. I found several ammonites, especially *Aspidoceras* and *Perisphinctes*; numerous fragments of a species of *Nautilus*, plenty of *Belemnites*, a great number of *Rhynchonella* and *Terebratula*, and many *Gastropods* and *Bivalves*, these last containing numerous species of *Ostrea*, *Exogyra*, *Pholadomya*, and *Pecten*; also plenty of *corals* and *spongia*.

The most important discovery was that of strata of Cretaceous age, which I found in the Gillet mountains south of Sheikh Husein and between Mount Abunas and the Wabbi. As is shown by the few but perfectly preserved fossils I found here, these strata belong to the Turonian. With these there are also in many places evidences of an eruptive period, which must have been at the beginning of the Cretaceous epoch.

The whole country, however, from Abulkassim and Abunas to the north-west and west, up to the Blue Nile on one side, and the sources of the Sobat on the other, is formed for the most part of Tertiary volcanic rocks. I found strata of Jurassic age only once again, namely, in the neighbourhood of Badattino, in the province of Gindeberat.

The formation of the great East African rift-valley may also belong to the Tertiary period. The north of this valley was once filled up by a great lake-basin, whose remains may be seen in the numerous small lakes which we passed by on our way. I found a proof of it on the Suksuk river, where I discovered strata containing numerous remains of mollusca embedded in its banks 80 to 100 feet above the water-level of to-day. The species which I found here are the same which still exist in the lakes Langanna and Ganjule.

Descending to a height of about 3000 feet above the sea, the gneiss formation is to be found in several places, as on the Blue Nile and on the Omo. Associated with it, quartzite occurs in various places, which, because of the gold it contains, or is supposed to contain, has awakened a lively interest for these countries within the last few years.

I collected about seven hundred specimens of rocks and about two thousand of fossils.

I can say but little concerning the botany, as this fell to the province of Dr. Ellenbeck. After the break-up of the united expedition, I had to accomplish single-handed the work which had been before divided between five Europeans, and therefore had but little time to collect plants. I could only obtain some two hundred specimens; whilst between Zeila and Adis Abeba Dr. Ellenbeck had brought together a collection of some two thousand five hundred specimens.

The chief work of our expedition, besides the geographical survey, was directed to zoological researches and collections. During my journey I passed through five different zoological regions.

Firstly, the Northern Somaliland, which showed in its fauna, especially near the coast, strong signs of a palæarctic or better mediterranean influence. Among the mammals we found here were *Gazella pelzelni* and *speekei*, two species of the northern group of gazelles, and further a *Dipus*. Amongst the birds there was an *Aëdon* and a *Galerita*, and amongst the reptiles an *Uromastyx* and a *Tarantola*. Also the enormous number of the *Geckonidæ* and of genuine lizards from the genera *Eremias*, *Latastia*, and *Acanthodactylus* were also remarkable.

The fauna of the Galla countries to the south of Harar resembles that of the northern Somali countries, and contain many of the same forms, as especially the "Gerenuk" (*Lithocranius Sclateri*), but is entirely lacking in any palæarctic influence. Amongst the birds, I will especially mention here the rare *Galeopsar salvadorii*, which was seen in large flocks on the banks of the Wabbi. Both of these regions show very many characteristic kinds, which do not appear in any other faunistic region of Africa; but one must remember that some of the species occurring here reach about as far as the Pangan river in German East Africa.

From the tableland of Didda on to the north-west, we find the pure fauna of the Abyssinian highlands, of which we first gained a knowledge through the explorations of Eduard Ruppel. Amongst the mammals, I will name here *Canis simensis*, the Abyssinian giant fox, *Oreomys typus*, a peculiar rodent; the "Jellada" Baboon: and amongst the antelopes, *Sylvicapra abyssinica*, the "Abyssinian duyker;" and the "Fike" of the Abyssinians, *Urebia montana.* On the mountain ridge which divides the Hawash valley from that of the Webbi Shebeli, this Abyssinian fauna extends eastward as far as Harar. We had already found many Abyssinian birds on the Gara Mulata, such as *Agapornis taranta*, *Bostrychia carunculata*, *Turdus simensis* and *abyssinicus*, and numerous others. These are all forms which are entirely lacking in the Somali districts.

Near the lakes of the great rift-valley I found an intermixture of faunas. Many Somali forms appear here, in addition to purely Abyssinian species and others, which until now we have only known from German and from British East Africa.

Thus near Lake Zwaj, there appears a form of Grant's gazelle, and the zebra which occurs near Lake Abaya is not *Equus grevyi* (the zebra of Somali and Galla lands), but *Equus granti*, firstly described from Masailand. The *hartebeest* is the Somali form, *Bubalis swaynei;* the reed-buck is the Abyssinian, *Cervicapra bohor.* Also in the mountain forests of the Omo district I found chiefly Abyssinian forms, but with them forms which had previously been known only from the mountain woods of Mau and of Ruwenzori; among the birds, for example, *Pholidauges sharpii* and *Stilbopsar stuhlmanni.*

On the Omo another element appears in a great number of West African forms, such as *Oriolus auritus*, *Lamprocolius glaucovirens*, and especially *Agapornis pullaria*, the common West African dwarf parrot.

After passing the Gurafarda chain we find the pure lowland fauna of the Sudan, which is especially characterized by its antelopes—*Bubalis lelwel*, *Adenota mariæ* and *leucotis.*

The zoological collections of the expedition are the greatest which have ever come to Europe from Africa at one time. I was able to collect more than 1000 specimens of mammals, belonging to about 140 different species, 16 of which I have already described as new. The bird collection was in Baron Erlanger's province until the break-up of the united expedition. After our parting I was still able to collect 1300 specimens, which belong to 375 different species, 10 of which I have been also able to describe as new.

The whole collection of insects resulted in about 30,000 specimens, besides which 2000 mollusca were collected; and large collections of reptiles, fishes, crustacea, olygochætæ, and other small animals have been preserved in spirits.

I took about 600 photographs during the expedition.

The PRESIDENT: Mr. Oscar Neumann, who has been so good as to come here to communicate a paper to us, has made a very important journey from Somaliland to the Nile, and has gone over a country which is very little known to us, rather to the north of the tracks taken by recent travellers. The paper will be one of very great geographical importance. I will now request Mr. Neumann to read his paper.

After the reading of the paper the following discussion took place:—

Major AUSTIN: I rise with some diffidence, as I have only seen quite a small part of the country traversed by Mr. Neumann, but I saw quite enough to thoroughly understand the difficulties he experienced during the latter part of his journey. As he has told us, during the rainy season the whole of the valley of the Sobat is one vast swamp, and two years ago, when I first traversed that country, going from the Sudan to Abyssinia, I experienced the same difficulties as Mr. Neumann. On that occasion I lost over a hundred donkeys and all the mules and camels I started from Omdurman with. There is one point I think I don't quite agree with Mr. Neumann about, and that is regarding the Gelo. Like many rivers in this region, I dare say he noticed near their origin they appear to be very much larger than they do lower down, as they narrow considerably towards their mouth. For instance, the Gelo, where I first struck it, in the year 1900, was considerably larger; in fact, three or four times as broad as where I ultimately left it to cross to the Akobo. The depth of course was very much greater, but at the same time there were several overflow channels which, as Mr. Neumann suggested, flowed north and joined the river Bela shown on the map, but I think the main stream does really flow into the Pibor somewhat to the north of the 8th degree of latitude. I do not know whether Mr. Neumann took any observations where he last saw the river, but I was so much struck with that fact myself during our passage along the river, that I at one time could scarcely reconcile the fact that the Gelo, where we first saw it and where we saw it two or three days afterwards, was one and the same stream. I cannot say much more about Mr. Neumann's journey except to congratulate him most heartily on the great success he met with, and on having produced for the first time a map of the country, a large portion of which has never been sketched by Europeans. He has filled up a great blank in the map from the Abyssinian highlands across the plains to the Pibor. I congratulate you most heartily, Mr. Neumann, on your most successful journey.

Mr. RAVENSTEIN: It is a matter of some surprise that the only part of tropical Africa concerning which our information was most copious and trustworthy more than four hundred years ago should have remained, down to our own days, one of the most attractive and interesting fields for our modern explorers. Fra Mauro's Abyssinia carries us far to the south beyond the Hawash. The general correctness of his delineation is all the more surprising, as it is altogether based upon information derived from Abyssinian visitors in Venice. Indeed, so copious were the details furnished that the Venetian friar was induced to spread his information over the whole of Southern Africa, which would otherwise have remained a blank. Unfortunately for the friar's reputation as a scientific cartographer, whilst he thus unduly expanded his Abyssinia, he curtailed the east of Asia; for, although he knew better, he did not venture to fly in the face of the orthodox belief of his day, and delineated our Earth as a disc lying in the midst of a circumambiant ocean. Later map-makers, whilst allowing Fra Mauro's Abyssinia to extend to the very extreme south of the continent, supplemented the authentic information obtained by him with what they found in Ptolemy or derived from the accounts of travellers, who, on the strength of the indulgences granted to all pilgrims to the Holy Land, came home with tales of the most marvellous kind. One of the most recent of these travellers was a German baron—not Baron Munchausen, but one Arnold von Harff—who, on his return to Germany in 1493, claimed to have marched to the source of the Nile, and to have traced that river down to its mouth in the Mediterranean. Several of the names of places mentioned by him I have discovered in maps of the fifteenth century, but I have failed, hitherto, to trace this apocryphal geography to its original sources. Subsequently, in the course of the sixteenth and seventeenth centuries, Abyssinia became better known than are several of our African protectorates even at the present day, and the maps of Tellez and Ludolphus are surprisingly correct. Southern Abyssinia, however, remained almost a *terra incognita* to our own days. What had been done up to 1883 you will find fully exhibited on my map published by the Royal Geographical Society, where the researches of d'Abbadie, Léon des Avanchers, Cecchi, and others have been fully utilized. An immense amount of work has been done since. The east, south, and west of that mountain region have been skirted by Harrison, Wellby, Donaldson Smith, Cavendish, Bòttego, Major Austin, and others, but its interior is as yet hardly known to us. Kaffa, of course, has been visited frequently; Captain Bolatovich has crossed part of the territory granted to Count Leontief; and there have been several other explorers, who do not, however, appear to have done geographical work of the first order. For this reason Mr. Neumann's journey across this region from the lakes in the east to the Sobat river, is of the highest interest. This region, in fact, with its complicated valleys and numerous independent communities, is one of the most interesting parts of Africa yet to be explored. At present we know little more than its outline, and it is much to be wished that a member of this Society would concentrate his energies upon this region. I feel sure that the results which a conscientious and consistent explorer of that kind would bring home to us after a few years' labour would redound to his credit, and give him one of the foremost places amongst the explorers of Africa even at so late a period.

The President: We have listened this evening to a paper of unusual importance, for it has discovered to us countries which were almost entirely unknown. I particularly refer to that long chain of lakes to the south of Shoa, which, I think, used in former days rather to puzzle Mr. Ravenstein. Our visitor this evening, Mr. Neumann, has certainly discovered one of those lakes, and cleared up questions relating to five of the others. Indeed, I think it may be said that he has discovered five lakes. He has traversed what I consider to be the most interesting part of unknown Africa, that is, the mountainous country to the south of Abyssinia. The names of the provinces were known to us before, but very little more—Kaffa, Jimma, Gera, Enarea. I remember many years ago, when I was in the north of Abyssinia, that a small caravan actually arrived from Kaffa, led by a man who had collected Kaffa coffee intending to sell it; he had traversed the whole of Abyssinia with the greatest difficulty, and having to pay heavy tolls. I think it was a most wonderful instance of commercial enterprise. I had several conversations with him through our interpreter, Dr. Krapf. We wished him well, and he started to go to the coast. A few days afterwards we heard that his caravan had been robbed and that he had been murdered in the pass. So that gives you some idea of the extraordinary difficulty these people have in opening up communication with the civilized parts of the world. Now that the empire of Ethiopia may be said to be restored, it may be hoped that these commercial difficulties will gradually disappear. Kaffa, it appears, has fallen off in its product of coffee. I have had the pleasure of drinking Kaffa coffee, and it is the best I have ever tasted. We trust that these people south of Abyssinia, under the present rule, will have their prosperity restored to them. I think there can be very little doubt that in ancient times when the earlier empire of Ethiopia existed, that it extended quite to the foot of these mountains of Kaffa. Mr. Neumann has mentioned the name of Mohammed Gran, an invader who broke up and destroyed and ravaged during many years the whole of that great empire of Ethiopia, and from that time it never recovered—not even in the days of Theodore—the whole of its dominion, until Menelik succeeded in actually restoring, I think to its ancient limits, the great empire of Ethiopia, from the rulers of which he claims to be descended. We all hope that under his rule the country will gradually recover its prosperity. These discoveries of Mr. Neumann are most important. You have heard from him of the great collections he made in natural history, and we have seen what an admirable series of photographs he has been able to take during his journey under great difficulties, and when I tell you that Mr. Neumann has been so kind as to come here from Berlin on purpose to read this paper to you and to communicate to you so much that is interesting, I feel sure you will pass a unanimous vote of thanks to him.

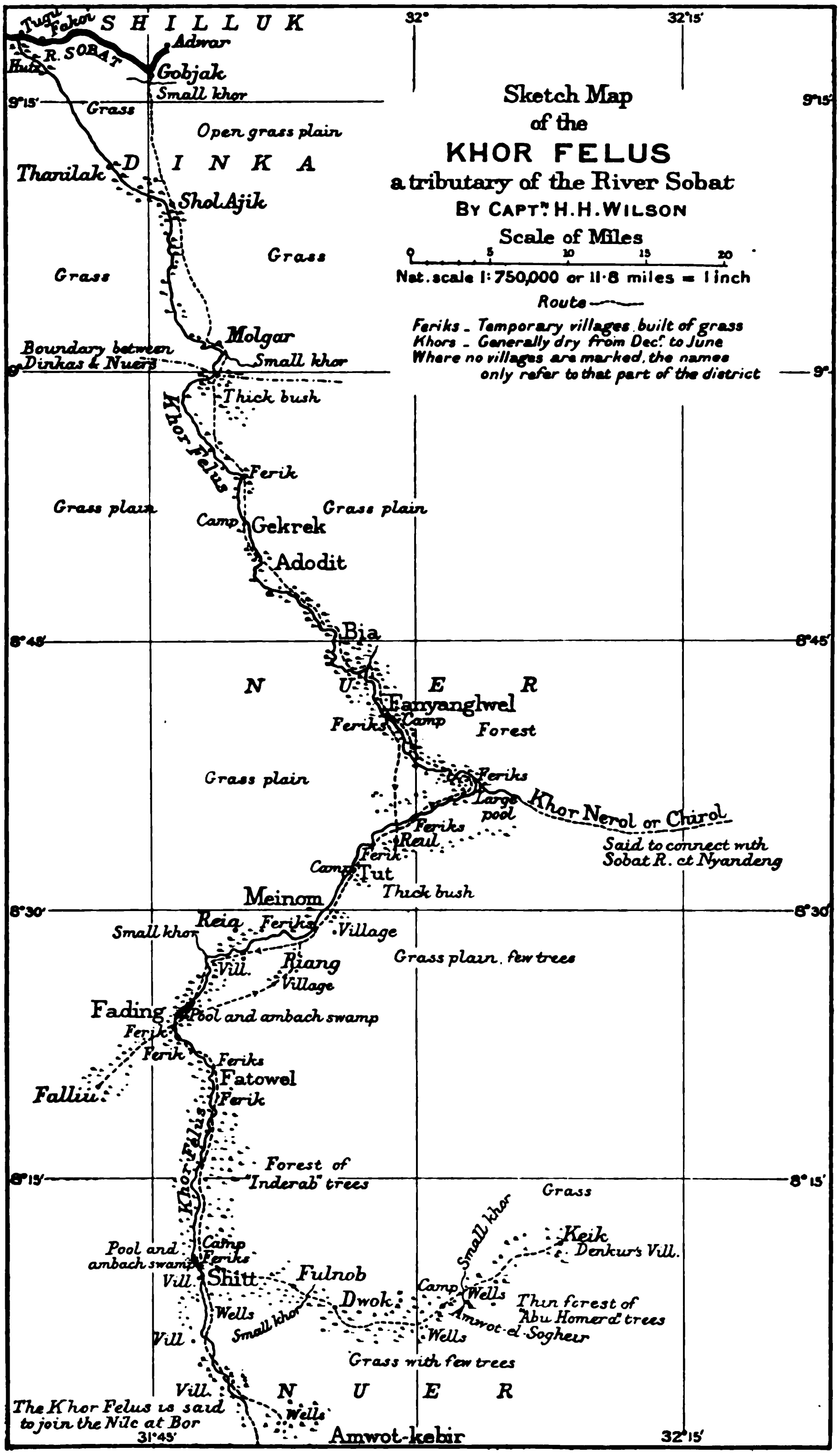
A TRIP UP THE KHOR FELUS, AND COUNTRY ON THE LEFT BANK OF SOBAT.

By Captain H. H. WILSON, Lancashire Fusiliers.

The large tract of land on the left bank of the Sobat river which is practically enclosed by the rivers Pibor, Sobat, Zeraf, and White Nile, is almost unknown; the only information regarding it has been supplied by local natives.

Owing to the extreme difficulty, if not impossibility, of an expedition making its way through this country during the rainy season, and until the long rank grass has been burnt and the soft ground hardened sufficiently for transport animals to move, it was not deemed advisable for the small expedition under notice to start before the beginning of April, 1902. The party consisted of 150 of the 10th Sudanese and Police, with twenty mules and thirty-five donkeys as transport.

Starting on April 15, the expedition marched from the village of Gobjak (some 20 miles from the mouth of the Sobat), and met the Khor Felus at Shol Ajik, some 8 miles inland, thus saving an unnecessary long march along the khor from its mouth, which is 10 miles from the Sobat mouth. The country here is flat and uninteresting, nothing but a vast grass plain, with hardly a tree to be seen. At Shol Ajik trees were met with, the banks of the khor being thinly wooded with a small growth of red talha, with a sprinkling of the unwelcome kitr thorn bush. The khor at this point is some 50 to 80 yards in width, mostly, however, filled up with weeds, the real water channel being clearly marked (though practically dry) by a deep narrow bed, some 15 feet lower than the adjacent banks. On to the village of Molgar the same country extends—grass, with a few trees; in one place there were traces of elephants which had been there in the rainy season. Other game seen was the bastard Tiang hartebeeste, which were really all the game seen in any quantity in the country. Molgar is a long scattered village on the right bank of the khor, and marks the limit of the Dinka tribe inland. From here onwards for many miles is uninhabited country, from Bia to Nerol being thickly wooded, in places densely, but only occasionally with any undergrowth that makes travelling difficult. Tiang hartebeeste were seen in considerable numbers along the whole route, and also quantities of waterfowl, pelicans, duck, geese, teal, and many various kind of crane and heron. In the vicinity of Fanyanglwel the first signs of Nuer habitation were met with in the shape of their cattle feriks, which are the summer residences (*i.e.* dry season, from January to May), and are built close to water, constructed lightly of grass only. No regular huts or tukls were met with until Riul was reached, where the banks became low and flat, and trees only at some distance on either side. The khor is here in the rains evidently broad and shallow, and, owing to mud, probably an impassable obstacle under such conditions. A noticeable feature in the Nuer tukls is the superiority of their construction compared with the tukls of the Dinkas, Anuaks, and other tribes of the Sobat, their cattle tukls being in many cases marvels of constructive art, given only boughs of trees, grass, and native tools for their building. The regular solidly built villages are placed at varying distances from the khor, probably dependent on high ground, and on the nature of the soil, if suitable for the dhura crops or otherwise, which are always grown in the vicinity of the rainy season tukls. Another noticeable feature, differing from the Shilluk and Dinka customs, was that the villages are not compactly built. The Shilluks and Dinkas generally build their tukls in close proximity, each village being a thick cluster of huts, the dhura being sown anywhere in the vicinity. In the Nuer case the tukls are built in twos and threes, at great intervals, probably each family being separate; the land around each homestead being sown and tilled by the dwellers therein. In the case of many Nuer villages, owing to the village being built in the woods, and the groups of tukls at intervals of 200 to 600 yards, it was impossible to estimate the size of the village without covering many square miles of country. Around the various large pools of water near Meinom, Fading, and Shitt, were thick fringes of Ambach; these pools being the chief source of supply for men and cattle in the dry season, it is only natural to have found the water so churned up and fouled by the cattle as to be nearly undrinkable. In places near these pools, where the adjacent soil was sandy, wells had been dug to obtain a cleaner supply of water. From Shitt the khor continues in a southerly direction, being broad and shallow, and it is said, runs on to Bor. The expedition left the khor at Shitt, and, relying on native assurances that water would be found in wells, pushed inland, and marched through the main Nuer villages, which were in places very thickly dotted about, and well built. The country from Shitt to the limit of the march was well wooded, chiefly with the Heglik tree. The ground


Sketch Map
of the
KHOR FELUS
a tributary of the River Sobat
BY CAPTN. H. H. WILSON
Scale of Miles
0 5 10 15 20
Nat. scale 1:750,000 or 11·8 miles = 1 inch
Route
Feriks _ Temporary villages built of grass
Khors _ Generally dry from Decr. to June
Where no villages are marked, the names only refer to that part of the district
32°
32°15'
9°15'
9°
8°45'
8°30'
8°15'
31°45'
Tugi
Fakoi
S H I L L U K
R. SOBAT
Hutz
Adwar
Gobjak
Small khor
Grass
Open grass plain
Thanilak
D I N K A
Shol Ajik
Grass
Grass
Molgar
Boundary between Dinkas & Nuers
Small khor
Thick bush
Khor Felus
Ferik
Grass plain
Grass plain
Camp
Gekrek
Adodit
Bia
N U E R
Fanyanglwel
Feriks
Camp
Forest
Grass plain
Feriks
Large pool
Khor Nerol or Chirol
Said to connect with Sobat R. at Nyandeng
Feriks
Reul
Ferik
Camp
Tut
Thick bush
Meinom
Reiq
Feriks
Small khor
Village
Grass plain, few trees
Vill.
Riang
Village
Fading
Pool and ambach swamp
Ferik
Ferik
Feriks
Fatowel
Falliu
Ferik
Khor Felus
Forest of "Inderab" trees
Grass
Small khor
Keik
Denkur's Vill.
Pool and ambach swamp
Camp
Feriks
Vill.
Shitt
Fulnob
Camp
Wells
Dwok
Thin forest of "Abu Homera" trees
Wells
Small khor
Amwot-el-Sogheir
Vill
Wells
Grass with few trees
Vill.
N U E R
The Khor Felus is said to join the Nile at Bor
Wells
Amwot-kebir

rose slightly, and as one got inland it became sandy and covered with fine grass, standing two to four feet high. The country also, here, struck one as being presumably fairly healthy in the rainy season, there being a complete absence of any rank vegetation. The dhura crops in April were just appearing, the young shoots being about six inches high, and a very considerable extent of ground around each village under cultivation.

At Amwot-el-Sogheir, another fairly large khor was crossed, it being, however, quite dry, and the expedition camped on the further side, alongside some wells, which it was learned were the only ones to be found in this part of the district. These wells were worth noticing: dug on the sandy banks of the khor, their depth varied from 20 to 30 feet, with a diameter of about 2 feet 6 inches. Owing to the solidity of the ground, the walls of the well stood without need of reveting, and great labour must have been expended in their construction. Steps were cut in the walls on opposite sides, to enable a man to descend and ascend. In one of the wells a calf was seen, standing in the water at the bottom, having evidently fallen in. It was rescued by one of the Dinka guides, who descended the well without difficulty, and brought up the animal unhurt.

The total eclipse of the moon (April 22) was seen to perfection at the camp; the natives being asked if they could account for the phenomenon, stated that of course the Government was angry with some one, and had darkened the moon to emphasize the fact! From the camp an expedition was made on the 22nd to Nuer villages in this vicinity, which were stated to be the headquarters of the chief sheikh of the Nuers of the whole country under notice, by name Denkur. Marching through a fairly thick forest of "Abu Homera" trees for an hour, and afterwards over an open grass plain for another hour and a half, brought us up to the above village, Keik. Standing in the centre of the village, and seen for about 3 miles off, was a conical mound of earth, well and solidly constructed by Denkur's people, as a token that Denkur was a very big man in that part of the world. It was stated that the bones of innumerable oxen were buried in the body of the mound, the cattle being slaughtered for the occasion. This act was to give greater value to the cone in the eyes of the surrounding tribes, as cattle are the most valued possessions of the tribes of the White Nile, and are practically all they live for. In fact, what religion they possess is centred in the cow. The height of this conical mound was about 50 to 60 feet, many large elephant tusks being firmly planted round the base and on the summit. The largest tusk measured 7 feet 10 inches, but of poor quality, as long exposure to rain and sun had ruined the ivory.

Having thus traversed as much of this country as was possible, on account of water, the party returned to the Sobat by the same route, and arrived on the river-bank on May 2. Owing to the extreme shyness of the Nuers, it was difficult to collect much information of their customs. Like all tribes at the Sobat, they are stark naked, and owing to their living in their own country, unmolested and out of all possibility of being in touch with civilization, it is only natural that they are sunk in barbarism and retain to the full all the inherited customs of their savage ancestors. Their hair is left to grow to a length of about 10 inches, and stained red with the ammonia contained in the dung and water of their cattle. Their bodies (of the men) are covered with the white ash of burnt cow-dung, like the Dinka tribe. This results from the men always sleeping in separate tukls, the floor of which is several inches deep with this white ash, resulting from the perpetually burning or smouldering fire of cow dung inside the tukl; the men actually make their bed in the ashes. The women do not thus cover themselves, but sleep on mats made of dressed cow-hide, and keep their own skins oiled and clean. The young unmarried girls, like the men, wear no covering, but the married women wear a loin cloth of whatever material is available, a leopard, gazelle, or sheep skin. The arms of the men consist entirely of spears (throwing) and shields, with the universal knob-kerry; bows and arrows are possessed by a very few—rifles they have none. It was reported that one of the big sheikhs possessed himself of a few at one time, but broke them up and made bracelets for his ladies. As I have mentioned above, the main wealth of the Nuers lies in their cattle and flocks of sheep. As the importance or otherwise of a man is gauged entirely by the number of his cattle, it follows that the quickest way to become powerful is for an individual, or a village, to appropriate the cattle of another individual or village, or better still of another tribe, and little raids of this kind are not infrequent.

At Nerol another khor joins Khor Felus, by name Khor Nerol, or Chirol, which is said to connect with the village of Nyandeng, on the Sobat. Owing to lack of water, it was found impracticable to explore any distance up this khor.

THE WINTER EXPEDITION OF THE "ANTARCTIC" TO SOUTH GEORGIA.

By Dr. J. GUNNAR ANDERSSON.

It is already known that the *Antarctic* returned to Port Stanley on March 26 from its first summer campaign in the Dirk Gerritsz archipelago, where a winter station was erected on Louis Philippe land. The leader of the expedition, Dr. Otto Nordenskjöld, who remained in the winter station, ordered the *Antarctic* in the winter season (April—September) to visit South Georgia, the Falkland islands, and Tierra del Fuego, to investigate the natural history of the regions mentioned. The scientific staff of the *Antarctic* for the work were the following: Mr. J. G. Andersson, geologist, acting scientific leader of the expedition—joined the *Antarctic* in Port Stanley on March 29; Mr. S. A. Duse, for topographical, meteorological, and oceanographical work; Mr. A. Ohlin and Mr. K. A. Andersson, zoologists; Mr. C. Skottsberg, botanist.

On April 11 the *Antarctic* left the Falkland islands and anchored in Cumberland bay, in South Georgia, on the 22nd of the same month. The route was almost in a straight line, and oceanographical work was carried out to a considerable extent. In this part of the ocean not a single sounding had been taken before, and amongst the six soundings taken here by the *Antarctic*, the following are the most important:—

Lat.	Long.	Depth in fathoms.
52° 7′ S.	55° 40′ W.	777
52° 47′ S.	51° 36′ W.	1558
53° 6′ S.	48° 71′ W.	1985
53° 43′ S.	40° 57′ W.	1818

The last of these soundings is the most interesting, as showing that there is a deep sea between the Shag rocks and South Georgia, but no submarine ridge connecting them.

During April 27–30 the expedition visited Royal bay in order to inspect the present condition of the German station of 1882–83. The dwelling-house was found to be in good condition, the observatories being partly blown down. Mount Krokisius was climbed by Mr. Skottsberg, in order to look for the thermometers left there by the German scientists; but the thermometers were broken, possibly thrown over by wind. The termination of the Ross glacier descending into Royal bay was examined several times by the German Expedition, and it was stated that in the year August, 1882—August, 1883, the face of the glacier had retreated 2500-3000 feet. Evidently this regression was only of a temporary nature; according to the determination made in April, 1902, by Mr. Duse, the face of the glacier has readvanced beyond the maximum stage observed by the German Expedition.

On May 1 a party, consisting of Mr. J. G. Andersson, Mr. Duse, Mr. Skottsburg, and one of the crew, was put on shore to work on land during two weeks, the *Antarctic* at the mean time visiting the Bay of Isles, Possession bay, and a bay situated south-east from Possession bay, and slightly marked, but not named, in the British Admiralty chart.

On May 12 the *Antarctic* returned to Cumberland bay, and on the following day both parties were reunited. For a month (May 14—June 14) the ship was anchored in a safe harbour in the interior of the southern branch of Cumberland bay, going out occasionally for a day in order to sound and dredge in the bay. During the first part of this time (May 14–26) the weather was splendid, and the ground almost free from snow, the land-survey making good progress. In the last two weeks violent gales were experienced, covering the land with snow to a depth of about 3 feet.

The result of our stay in Cumberland bay is a detailed investigation of that part of South Georgia. The whole bay and its surroundings, an area of 250 to 300 square miles, was mapped on the scale 1 : 100,000, some parts of higher geological interest having been surveyed on the double scale. Of the excellent harbour already mentioned, a survey on the scale 1:10,000, with numerous soundings, was made. In the bay forty soundings were taken, indicating that the greatest depths are 137 to 170 fathoms, and that there is in front of the bay a coast-bank with a depth of 97 to 98 fathoms.

The geological survey gives evidence of a distinct plication in this region, the axis of the fold being nearly parallel to the longitudinal axis of South Georgia. In a rock in this folded formation was found a fossil, a *bivalve*, not yet determined.

The glacial phenomena are magnificently developed in Cumberland bay. We found here traces of two glaciations—an older, almost total, and probably filling the whole bay out to the coast-bank; and a second, more recent, of much less extension, but marked by terminal and lateral moraines of gigantic dimensions. (A fuller report on this subject will be published in the next number of *Ymer*, the journal of the Swedish Geographical Society.)

During the voyage to South Georgia twenty-five dredgings were made in depths reaching to 170 fathoms, most of these being taken in Cumberland bay. Here we made rich and varied collections of a fauna luxuriant both in species and individuals. Skins, skeletons, and embryos of sea-leopards and sea-elephants were collected.

The botanical investigations, though carried out in winter-time, have added to the phanerogamic flora two forms new to the island, besides the thirteen species previously known. Moreover, there have been made considerable collections of lower land-plants, and of marine algæ from depths to 55 fathoms.

On June 15 the *Antarctic* left South Georgia, returning in a wide curve to the north up to 48° 27′ S., and re-entered Port Stanley, July 4. During the homeward voyage seven soundings were taken, two of them indicating considerable depths in the hitherto unknown area north-west from South Georgia.

Lat.	Long.	Depth in fathoms.
50° 58′ S.	38° 54′ W.	2572*
48° 27′ S.	42° 36′ W.	3279

Deep-sea temperatures and samples have been taken in nine series in all between the Falkland islands and South Georgia, but the material is not yet examined.

The principal interest during the voyage from South Georgia was attached to the deep-sea plankton. Hauls with large nets (10·5 and 3 feet diameter), from 1000 to 1500 fathoms depth gave rich collections of bathyplanktonic animals—fishes, medusæ, crustaceans, etc.

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* 2572 fathoms being a minimum, as it is doubtful if the bottom was reached by this sounding.

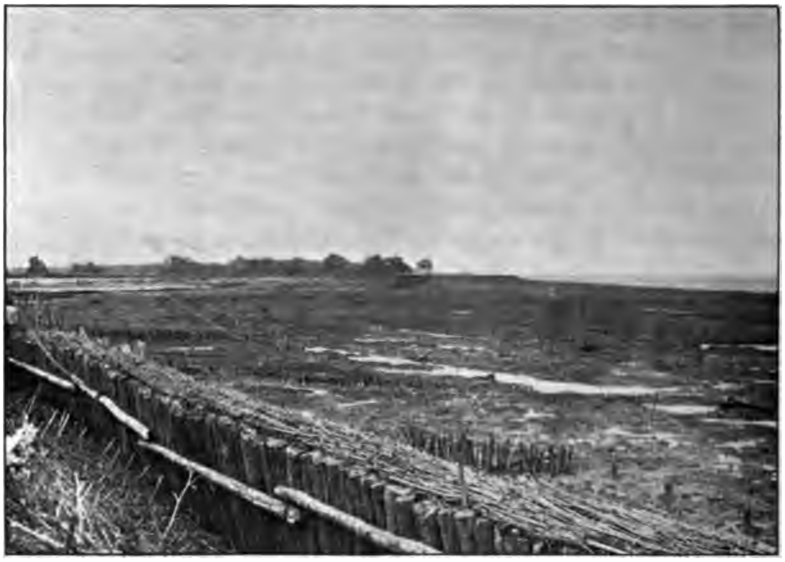
It is remarkable that no antarctic icebergs were seen during the whole expedition to South Georgia.

Port Stanley, on board the *Antarctic*, July, 1902.

THE SHORE OF DEMERARA AND ESSEQUIBO, BRITISH GUIANA.

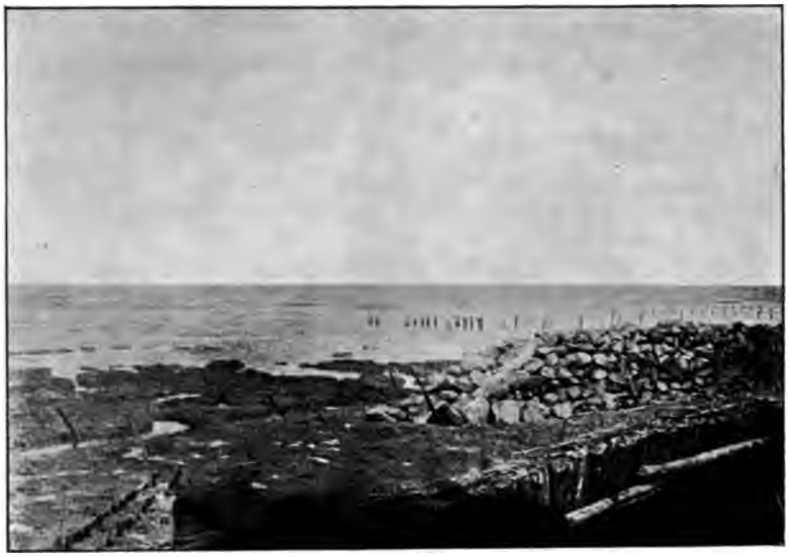
By FRANK J. GRAY.

The shore of Demerara and Essequibo consists principally of "sling mud" with small deposits of "caddy" and broken shell above high-water mark. The only exceptions to this are the sandy shores which lie in front of Golden Fleece and other plantations adjoining the mouths of the rivers. The subsoil is the clay of the country. The "sling mud" is a non-calcareous plastic clay, similar in composition to the subsoil, but containing an excess of sand. It appears to be derived from the subsoil clay by the process of erosion and attrition by the waves, and by the addition of the sand of the "caddy" held in suspension by the sea.

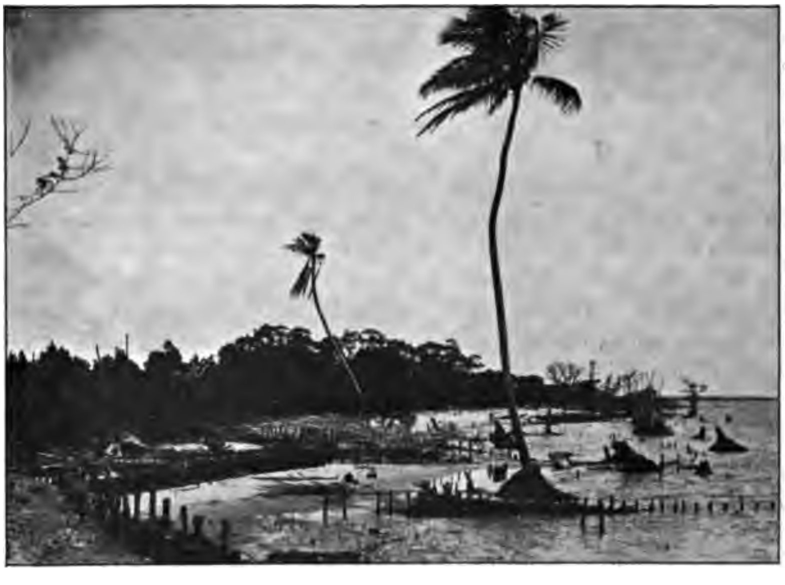


SEA DEFENCES AT PLANTATION HOPE, DEMERARA.

The "caddy" consists of fine sand, mixed with clay and calcareous matter. It differs essentially in composition from the "sling mud," and therefore is not of the same origin. It appears to be derived by erosion from the subsoil of the land immediately adjacent to the shore.



SEA DEFENCES AT PLANTATION HOPE, DEMERARA.



ENCROACHING SEA AT PLANTATION CULLEN, ESSEQUIBO.

The sand of the Golden Fleece and other shores which adjoin the rivers, is much coarser than the "caddy" sand. It appears to be derived from the material brought down by the rivers, for it is identical with the material deposited on their banks. It is noticeable that the river Essequibo spreads clear fresh water over the surface of the sea for a radius of about 2 miles.

The following are analyses of the principal shore materials:—

Dried Sample of Subsoil Clay.

Insoluble residue (sand)	27·05
Silica (SiO_2)	31·12
Alumina + Ferric oxide ($Al_2O_3 + Fe_2O_3$)	28·77
Lime (CaO)	0·11
Magnesia (MgO)	1·66
Combined water, organic matter and loss	11·29
	100·00

Sample of Sling Mud.

Insoluble residue (sand)	48·68
Silica (SiO_2)	11·74
Alumina + Ferric oxide ($Al_2O_3 + Fe_2O_3$)	27·44
Lime (CaO)	*nil*
Magnesia (MgO)	1·88
Combined water, organic matter and loss	10·26
	100·00

Sample of Caddy.

Insoluble residue (sand)	68·12
Silica (SiO_2)	5·95
Alumina + Ferric oxide ($Al_2O_3 + Fe_2O_3$)	12·34
Lime (CaO)	5·07
Magnesia (MgO)	1·18
Carbonic anhydride (CO_2)	3·67
Combined water, organic matter and loss	3·67
	100·00

The normal wave-action of the sea and the velocity of the tidal currents are very slight; but at times they acquire a force sufficient to move the extremely light mud in large masses, and thus to denude the shore in places. Where this occurs, the sea dams are liable to be undermined and breached.

The sea dams are clay embankments, built for the purpose of preventing inundation by the sea. To prevent abrasion they are, in some cases, faced with bush faggots, held down by spars; in other cases they are defended from the wash of the waves by a fascine breastwork. Wherever practicable a wide belt of courida bush and trees is left seaward of the dam. Breakwaters, either of bushwork or of pell-mell blocks of stone, are also resorted to. But all these devices appear to be ineffectual as methods of permanent protection, and their maintenance is found to be very costly. On this account, Messrs. Case &

Gray, of Westminster, were called in to report for the Colonial Government and the principal landowners in 1890.

It should be mentioned that along part of the sea-front of Golden Fleece, where the sea does not encroach, the full of the shore has been planted with sedge grass to prevent the sand from being blown away, and to preserve the natural barrier against the wash of the waves at high tides.

THE SHORE OF PLANTATION GOLDEN FLEECE, ESSEQUIBO.

SOME GEOGRAPHICAL PROBLEMS.*

By Colonel Sir T. H. HOLDICH, C.B., K.C.I.E., V.P.R.G.S.

The Progress of Geographical Knowledge.—With so large a field as that which is embraced by geography before us, I feel a little doubtful which way to turn in order to gather into one short space both the scattered records of recent geographical history and to present to you at the same time illustrations of some fixed principle which, in the course of the development of our geographical knowledge, must govern the progress of it. Last year you heard from Dr. Mill a most excellent summary of the present phase of that development in this country. You heard not only of great activity in the wide world of the unexplored and unknown, but of new efforts to train up a fresh generation of explorers; of new schools springing up amongst us; fresh evidence of the faith that is in us that geographical knowledge points the road to commercial success; happy intimations of the existence of a yet higher faith—the faith which believes that scientific knowledge of the world's physiology is worth the getting for its own sake, whether it paves the way to golden success or not. And now, whilst recalling the chief geographical events of the year that has passed; whilst counting the landmarks on the road to a higher geographical education, I would also claim your attention for a brief space to a few technical problems which beset the business aspect of future procedure, and which, so long as we make it our boast that we belong to the biggest empire in the world, ought most certainly to attract our earnest attention.

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* Presidential Address to the Geographical Section at the Belfast Meeting of the British Association for the Advancement of Science, September 11, 1902.

The unknown world is growing daily smaller. It is, indeed, narrowing its area with a rapidity which is absolutely regrettable. If you think of those delightful days when men who went "down to the sea in ships" brought gold and ivory to the steps of Solomon's Temple, believing that beyond their nautical ken all the rest of the world was but flat emptiness; or even centuries later when Marco Polo's truthful tales of Asia were discredited as wild fables; or again in almost modern times when Vasco de Gama bent his knees in pious prayer ere starting on the buccaneering venture which was to change the destinies of the East, you will find it almost impossible to look at the well-turned-out maps of to-day, wondering where next it may be possible to strike a new feature or unfold a new vista to geographical enterprise, without something like a sigh. But it is with the world as we find it mapped to-day that we have now to do, searching out the position of such blank spaces as still exist, and considering the best means of dealing with the vast area of its half-exploited surface so as to obtain the best results for the time spent on completing our knowledge of it.

Antarctic Prospects.—To the Polar regions we naturally turn first, for they form the special domain of modern initial exploration. We are very far yet from having elucidated the great geographical problems of sea and land distribution which lie hidden under the depths of palæocrystal ice. We only know indeed from inference that at one end of the world there exists an unmapped sea, and at the other an unmapped continent, round the edges of which we are even now feeling our way. When the *Discovery* left the New Zealand port of Lyttelton on December 24 last for the South Polar regions, this was the quest which, in the modest language of her originator, Sir Clements Markham, lay before her: "to determine as far as possible the nature and extent of the South Polar lands," and to "conduct a magnetic survey." If we look at the unexplored area of these South Polar lands as a whole, and examine the plan of international geographical campaign which has now been directed against them, we shall find, I think, that the present enterprise is by far the most complete and systematic, as it is the most scientific, that has yet been undertaken in the Far South. It is impossible but that great results should be attained from so complete an investment of the unknown continent.

With the *Discovery's* investigations, which will be directed to Victoria Land—the land of the historic volcanoes Erebus and Terror—from the side of Tasmania and New Zealand, will be associated at least three other expeditions, all aiming at a final solution of the South Pole problem. From South America Otto Nordenskiöld's expedition has taken the shortest sea route past the South Shetlands to Graham's Land, and has already passed a winter amidst the ice. From South America, again, the Scottish Expedition under Bruce will work its way past the Sandwich islands, skirting the antarctic circle, some fifty degrees to the east of Nordenskiöld, almost on the Greenwich meridian, and as nearly opposite as possible to the *Discovery's* attack from the other side of the pole; whilst between the two will be the German Expedition of the *Gauss*, pushing southward about the meridian of 90° E., a worthy rival in scientific equipment to our own ship the *Discovery*. And there is no branch of scientific inquiry which will be advanced by this international attack on the great unknown southern land of more interest than that which pertains to the history of the world's geography. Independently of securing a firmer outline to the vague definition of southern land areas of the present day, it is there that we hope to find evidences of another distribution of those areas in primeval times. Shall we be able to trace the Patagonian formations, those recent basaltic lavas which overlie trees, beyond that point in Graham's Land where we know that they occur again, to the Australian side of the Southern Pole? Shall we find that Erebus and Terror are but the natural extension of that magnificent array of volcanic cones which overlook the Pacific from the Patagonian Andes? Will the Miolania, the great turtle of Patagonia—not unknown in Australia—complete with his bones another link in that chain of many evidences that Patagonia and Australia once met across the extreme south? You may say this is not geography. I hardly know whether in these days it is still necessary to plead that between geography and natural sciences, whether of geology, biology, or anthropology, the connection is so intimate that in the actual field of research it is impossible to disconnect them. Modern geography is but a development, and whilst the process of its evolution is perhaps to be found in strictly geological fields, it has so modified and influenced the problems of life and the distribution of it throughout the world that a collector of facts like myself finds it convenient to accept, for the mere sake of simplicity, the science of geography as the best basis for divergent inquiries into many other scientific fields, which can be differentiated at leisure by the natural philosopher.

Necessity for Study of Geographical History.—But whilst we are justified in expecting much from this great international movement we must still moderate our expectations. We must admit that in the field of purely naval exploration we have not the same developments in mechanical and instrumental accessories which place within our reach the possibility of conducting land expeditions on far more scientific and exact methods than were possible to our grandfathers. Wireless telegraphy, for instance, will not yet enable a ship fast bound in arctic ice to determine her longitude, and the restless ocean still precludes the use of many of the more finely graduated instruments which are essential to the exact measurements pertaining to triangulation. Methods and instruments, indeed, will not differ materially from those adopted by Franklin or by Ross more than half a century ago. Better instruments of their class are no doubt within reach, owing to the extraordinary accuracy of modern production; but better hands to hold them it would be impossible to find. We are often so pleased with ourselves in these days that we are apt to forget what has been done by our geographical forerunners in the same field as ourselves. I have but lately returned from a journey full of geographical interest which has carried me over some of the tracks left many years ago by a British scientific expedition to the South seas, which will be ever associated in the memory of all geographers with the names of Charles Darwin and H.M.S. *Beagle*. With the wider scope for gathering information which is afforded in these days by the growth of civilization and the shooting out of its long tendrils into the waste places of Patagonia, it has been possible to verify some of the suggestions as to the structure and geographical configuration of that southern continent which were offered by the observations of Darwin, and to examine here and there, in some detail, the results of recent local surveys in testing the accuracy of the coast outline and of the coast soundings established by the *Beagle*. Of the former I can only say that they seem to me prophetic; of the latter, so little change has taken place in South American coast configuration during the last fifty years that practically the charts of the *Beagle* are the charts of the Chilian and Argentine admiralties of to-day, with hardly a noticeable variation. Such magnificent results as were achieved then are hard to beat at any time. We do not hope to beat them. We can only hope to imitate them. They stand good for all time, and it is useful to recall them now and then in order to emphasize a truism which is occasionally overlooked by modern geographical explorers. It is not the most recent work in the field of exploration which is necessarily the most valuable. One of the great sins of omission in modern exploration is that of a failure to appreciate the efforts of preceding geographers in the same field of research as ourselves—the want of a patient absorption of all available previous knowledge before we attempt to add to the sum of it. We are not all of us gifted with the patient determination of that great traveller Sven Hedin, who spent three years in reading about Central Asia before he wrote a word on the subject. It cannot be too strongly urged in these days of narrowing fields for activity that, although geographical research is essentially an active function of an active life, it demands yet more and more, as time goes on, the application of the scholar added to the determined energy of the explorer.

Contraction of the World's " Terra Incognita."—It is, however, when we leave the high seas with their almost inexhaustible store of unexplored ocean floors and icebound coast-line, and turn from oceanography to the more familiar aspects of land geography that we find those spaces within which "pioneer" exploration can be usefully carried to be so rapidly contracting year by year as to force upon our attention the necessity for adapting our methods for a progressive system of world-wide map-making, not only to the requirements of abstract science, but to the utilitarian demands of commercial and political enterprise.

Asia.—Take Asia, for example: nearly half of the great continent pertains to Siberia, and within the limits of Russian territory the admirable organization of her own system of geographical exploration leaves no room for outsiders to assist usefully, even if political objections did not exist. In Central and Southern Arabia there is undoubtedly still much to learn, but of the remaining countries which intervene between the Mediterranean and India, of Persia, Afghanistan, and Baluchistan, it can only be said that the work of the geographical pioneer has already ended where that of the engineer and surveyor has commenced. In the Furthest East again—in Manchuria, China, Tonkin, and Siam—there is much more room for the practical exploration of the road and railway maker than there is for the irresponsible career of the geographical traveller. The highway from China to India is almost as well known as that from London to India, and the activity of railway enterprise in the south of Asia bids fair to rival the triumphs of Siberia. It is only in the central deserts of Mongolia and the wastes of Tibet spreading southwards to the Himalayas that we can find untrodden areas of any great magnitude, and even in Central Asia before venturing on a statement of future possibilities in the field of exploration, it would be well to wait for the records of that most intrepid traveller, Sven Hedin, who promises us material of scientific and historical interest as the result of his last three years' travel far in excess of the monumental contributions which he has already made public. Historically the interest of the world of inquiry in Asia, where we find the origin of the great races of the world and the birthplace of all religions, must always be immense; but that history can only be elucidated by a clear illustration of the great highways of the Continent which were open to the vast migratory movements of mankind in prehistoric periods. We do not in the least understand the condition of climate, nor are we quite certain even of the relative distribution of land and water in High Asia in the days when its swarming population first began to flow south and west, carrying the elements of a language which we have been accustomed to regard as primeval into the swamps and plains which lay beyond the Himalayas or the Caspian. It is only through geographical research that some dim outline of those early stories can be realized; and although the researches of Stein and the marvellous discoveries of Sven Hedin around the ancient lake district of Lob Nor will, after all, only throw the world's history back for a few centuries, it is by means of these first steps backward that we can feel our way to an appreciation of the earlier processes of this phase of human evolution. Nor in the interests of utilitarian commercial speculation is geographical research in Asia yet to be set aside. We indeed know comparatively nothing of its resources in mineral wealth. It is quite within the bounds of possibility that one of the great central treasure houses of nature lies enveloped in the geological axis of the highest mountains of the world, and that we may yet be enabled to explain why every river which flows from Tibet washes down gold in its bed. But this will only be when the Tibetan lama is prepared to shake hands with the Uitlander; and I fear that recent South African history will not encourage the embrace. Meanwhile there is no more promising field still open to the *bonâ fide* explorer than that of Tibet and the farthest ranges of the Himalayas. Few people are aware how vast an extent of the Himalayan area still remains untrodden by any European. This is due to no want of enterprise on the part of our Indian surveyors and political officials. It is due partly to physical inaccessibility, and partly to that intense (and easily understood) objection to the interference of the stranger in which many of our transfrontier neighbours permit themselves to indulge. Nevertheless would I commend to those who still desire to walk in the rough and thorny path of pioneer geographical discovery a similar enterprise to that of our aforetime secretary, Mr. Douglas Freshfield, who lately succeeded in passing beyond the bounds of official exploration into the Eastern Himalayas. We have had many travellers in the Himalayas, but they have not always distinguished between the fascinating pleasures of romantic adventure and the earnest pursuit of geographical business.

Study of Glaciers.—To Mr. Freshfield we certainly owe an introduction to a new vista of great scientific interest in the study of the formation and movements of glaciers. Here, perhaps, we are treading gently on the skirts of geological science; but I have never yet found that part of the world where the careful study of local geographical conformation will not inevitably invoke an inquiry into geological construction. We must accept the inevitable criticism and go on with our glaciers. Where in the world can there be such an area for research into the conditions of glacial formations as is presented by the Himalayas? I grant the physical and political difficulties in the way to which I have referred, but still well within the limits of our own red border there are glaciers yet to be studied, which, if not the largest, are yet large enough to satisfy the loftiest aspirations, and beyond that border the difficulties of approach are lessening day by day, and are no longer so formidable that they need hinder the steps of any determined explorer.

South American Glaciers.—The speculative interest in glacial movements and their influence on the geographical conformation become far greater when one moves in a country which has been recently shaped and polished, grooved and fashioned, by glacial action; when huge blocks of granite or porphyry, standing sentinel over terraces and ancient glacier-beds, witness to the passing of icebergs in prehistoric seas. Such conditions one may find in two widely separated areas—viz. in the Pamirs and in Patagonia. What causes led to the formation of the first vast ice-cap of which the glacier is the latest evidence? what caused its disappearance, its reappearance? why are the glaciers again withdrawing from the mountains? and what causes the universal process of modern desiccation, of which there is such ample evidence in the Pamirs, in Baluchistan, in Patagonia? It is to the Himalayas that we turn first for an answer to this question; but there are other fields almost equally promising, and one of them is to be found in South America. No one now can pretend any longer that we know nothing of Patagonia. Probably no country in the world has been described by so many geographers in so many different ways; there, at any rate, is a land of glaciers and snowfields awaiting research which presents few of the physical difficulties of the Himalayas. Here is a wonderful country truly, where glaciers reach down to the sea in low latitudes, casting little icebergs into waters fringed by green banks of fuchsia and myrtle, and of bamboo; where the laurel grows into magnificent timber, competing with the Patagonian beech for root-hold on the moss-covered soil. The round grey heads of the granite hills, scratched and seamed by a discarded ice-cap on one side of the narrow straits balance the snow-bound peaks of the Cordilleras on the other. No physical difficulties bar the way to the investigation of glacial phenomena amidst some of the most striking coast scenery in the world. Near the parallel of 51° S. are two Patagonian lakes closely associated—Argentina and Viedma—which offer opportunities for the study of glaciers such as are probably not to be found anywhere else in the same latitude. For here the phenomenon of disappearance is in the stage of natural illustration. Glaciers are disappearing rapidly which but a few years ago seemed to be a permanent feature of the surrounding mountains, and the lake surface is chequered with their *débris*. There, too, may be studied for hundreds of miles northward the natural sequences of their disappearance—the formation of freshwater lakes and their gradual desiccation in turn—whilst all around there is the continued story of geographical evolution due to the alternate forces of glacial and volcanic action written in gigantic characters on the face of nature.

Central South America.—Not very much has been added of late years to our practical knowledge of the hidden depths of Central South America, except from the inexhaustible mine of information possessed by that eminent geographer Colonel Church. A Brazilian expedition in 1890; the explorations of a commission sent to investigate the interior with a view to the establishment of new political capital to Brazil in 1892–93; the discoveries of Dr. Ramon Paz in 1894, and a chequered journey in the valley of the Orinoco by Stanley Paterson in 1897, form the principal records of modern days. There is doubtless much which is of the greatest commercial and political interest still to unravel in connection with the geography of the great river-basins of the continent. But in South America we are threatened with perhaps the greatest development of what I may call artificial geography that the world has ever seen. Not only will the consummation of the Panama canal project change the whole system of our Western sea communications, and probably exercise a more enduring effect on the world's commerce than even the Suez connection between East and West, but the possibilities of linking up by a central canal system the three great river-basins of the South—that of the Orinoco, the Amazon, and the Plata—is under serious consideration, and the mere project will in itself lead to an exhaustive examination of much untravelled country. Thus, even South America no longer offers a large field for the geographical pioneer of the future. With its narrowing areas of *terra incognita* and its almost phenomenal advance towards a leading position as the pastoral and meat-producing quarter of the habitable globe; with possibilities of development in this particular line probably exceeding those of Australia, New Zealand, and South Africa all put together, it is surely high time that South America turned her attention towards a combined and sustained international effort to place her scattered and most insufficient geographical surveys on a sound geodetic basis extending through the whole continent.

North America.—In the geographical fields presented by North America, as also by Australia, magnificent as are the opportunities for acquiring that personal acquaintance with the great depositions of nature which environ new conditions of life, and shape the course of human existence to its appointed ends, or, in other words, to acquire a geographical education from original sources of instruction, there is but little opening for the enterprise of the pioneer who aspires to show the way into new fields. There is no lack of native enterprise in colonies peopled by the stout-hearted descendants of generations of explorers. Neither Canadians nor Australians wait for England to show them how to develop the resources of their own country, or pilot the road to new ventures. On the contrary, we have to turn to Canada now for instruction in the higher art of geographical map-making, and to admit that England has been left far behind in the development of the special branch of science which deals with the illustration of the main features of geographical configuration in relation to their geological construction.

Africa.—In Africa the advance of our knowledge of the main outline of the geographical features of the continent has been so rapid since the days when the Nile was first traced to its source by Spoke that a perfect network of explorers' lines of travel now embraces the continent in its meshes, and it is only in the intermediate spaces that room for enterprise on the part of the pioneer is left, even if it may not be said altogether to have vanished. A reference to the little map published by Mr. Ravenstein in the *Geographical Journal* for last December will show you at once that the hydrography of Africa has been fairly well traced out in all its main arteries, leaving but few unexplored spaces of any great extent; and that such spaces, where they occur within the area which is especially open to Englishmen, demand an organized system of exploration more complete in its results, more carefully balanced in its relation to the geographical illustration of those lands which are beginning to form centres of civilization than can be secured by the process of pioneer route-making. In short, we want a system of geographical surveying allied to those systems which have been perfected after years of careful experiment by Canada, or Russia, or France, or by England in India. This, however, brings us into a field of technical inquiry of great importance, into which, so far as it deals with geography, *i.e.* with the measurement of the Earth's surface and the illustration of its configuration by means of maps, I propose to enter briefly in this Address.

Modern Requirements in Geographical Map-making.—You will agree with me that geography in the abstract, without illustration—the geography which used to be taught by geography books without maps—is but a poor and inefficient branch of academic knowledge, hardly worthy even of an infant school. It does not matter what branch of this comprehensive science you approach, whether it is historical, or physical, or political, modern or ancient, the only substantial presentment of the subject to man's understanding is that which has recourse to map illustration. Words (especially words bearing such indefinite applications as our modern geographical terminology) can never convey to the imagination the same substantial illustration as maps convey to the eye. You may think that all this is mere truism; so it may be; but I assure you that what I may call descriptive geography, that is to say, geography without the aid of maps, has more than once nearly precipitated national disaster in quite modern times—disaster quite as perilous as any which in military fields has been caused by blank, wholesale ignorance of the features of a country in which strategic movements are undertaken. There comes a time in the history of every developing country when the increase of its people, and the consequent distribution of land, demands surveys for the purposes of fiscal administration. Consequently such surveys are common everywhere; and from these have been built up, piece by piece, like a child's puzzle, the geographical maps of many half-occupied lands, illustrating only such portions as are adaptable to economic development, and leaving blank all that promised to be unproductive and unprofitable.

Field of Geodesy.—It was only when it was discovered that the sum total of such a production was apt to cause great confusion in land assessment, inasmuch as it often did not equal the actual area of the land distributed, that there arose a school of mathematicians who concerned themselves with determining the dimensions and figures of the Earth, and founded that apparently complicated system of primary map-making which now takes count of such matters as the curvature of the Earth's surface, the convergency of meridians, and other spheroidal problems which affect the construction of the map. Thus arose "geodesy," and geodesy has numbered amongst its apostles many of the greatest mathematicians of the age. Geodesy, the science which deals with exact measurements, was never an embodiment of abstract mathematical investigation. It had always a utilitarian side to it, and it is unfortunate that this view of the science has been occasionally lost sight of in late years. For we have not done with geodetic investigation yet. Magnificent as are the results obtained by the mathematicians of the past, there are still further refinements to be introduced into those factors which we daily use for the reduction of our terrestrial observations ere we obtain perfect mathematical exactness (if we ever attain it) in our results; and we still must look to the processes of geodesy to give us that backbone, that main axis of indisputable values from which our network of triangulations may spread during the first steps in geographical map-making. To a certain extent, geodesy is the support of technical geography, and a short inquiry into its present conditions of existence may not be out of place.

It is to North America that we must now turn for instruction in the latest development of the science, and to South Africa that we must look for its future application. Russia has not lost sight of the necessity imposed on her for an extension of her magnificent European geodetic system through the vast breadth of her Asiatic possessions, but we ourselves in India are concerned nowadays rather with scientific observations on collateral lines, and with the collating and perfecting of the results attained by the great achievements of past years, than with any developments in fresh fields of geodetic triangulation. Germany and France, ever alert where colonial interests are concerned, are busy in Africa, but I am not prepared to say how far their geographical interests are based on the strict principles of geodesy.

In North America, along the meridian of 98° through Texas, Kansas, and Nebraska, geodetic triangulation still forms one of the most prominent schemes of modern work undertaken by the Coast and Geodetic survey; and in South Africa there is growing northward into the Transvaal slowly, but we hope surely, the framework of a gigantic arc which one day will be extended by Sir David Gill from the Cape to Cairo.

I am anxious to impress on you that the science of geodesy is not a science of the past. It is still active, and with all its refinements of minute accuracy and exact precision in observation and in calculation, it should be the initial mainstay, and it must be the final court of appeal, as it were, for all those less rigorously conducted surveys of the reconnaissance and exploration class which we term geographical.

But this accurate framework, this rigorously exact line of precise values which ultimately becomes the backbone of an otherwise invertebrate survey anatomy, is painfully slow in its progress, and it is usually haunted by the bogey of finance. It does not appeal to the imagination like an antarctic expedition, although it may lead to far more solid results, and it generally has to sue *in forma pauperis* to Government for its support.

Geographical Surveys.—And thus it happens that long before the tedious and expensive processes which are involved in the term "geodetic triangulation" can possibly be carried to an effective end, the cry goes up for a geographical survey. It is wanted by the administrator, to whom it is all-important that he should know the roads and river communications, and the productive areas of the land he has to administer, and be able to locate the various tribal sections or peoples with whom he has to deal. In the political department a geographical map may be said to be absolutely necessary for the political purpose of defining limits and boundaries. It has been, I am aware, occasionally dispensed with, but never with satisfactory results. To the officer on whom rests the responsibility of preserving peace and good order it is most desirable that the military features should be fairly represented in such a manner that at least a general plan of action can be arranged at short notice. For the economic development of the country it cannot be too strongly urged that a general geographical outline of its surface is indispensable to the selection of lines for special technical examination, whether for roads, railways, canals, or telegraphs. How often lately in the history of our colonial or frontier progress have vast sums been expended on special lines of railway in ignorance of the fact that better alignments of infinitely less physical difficulty would have been at once revealed by a general geographical map even on the smallest scale? In short, the cheapest, the quickest, the surest, indeed the only satisfactory method of regulating the progression of public works, the development of commerce, the proper recognition of the frontier boundaries, the administration of justice, and the military control of a large and growing colony, or of a long stretch of military frontier, is to be armed with a perfect summary of what that country contains in the shape of a geographical map; and yet it is only quite lately that this fact has been recognized by English administrators and English generals in their dealings with new colonies and new frontiers. Russia learnt the lesson a generation ago at least. When she reached out a hand for Constantinople, her army was accompanied across the Balkans by whole companies of surveyors, who worked on no sketchy system of indicating lines of route here and there. They pushed at least seven series of triangulation across the mountains, and on that as a basis they mapped the whole country in detail on a good military scale (about an inch per mile) right up to the very gates of the Turkish capital. For years her brigade of topographers has been busy along her Afghan and Siberian frontiers. In Persia, Baluchistan, the Pamirs, and China, wherever in fact there may be in the future some prospective view of a closer political, commercial, or military interest than exists at present, there they are to be found. France has always been strong in the geographical field, and the late achievements of Frenchmen in the world of exploration and of exploratory map-making are only equalled by the scientific knowledge and literary ability displayed in their technical literature on the subject. Colonel Laussedat's contribution to the 'History of Topography' is to be reckoned with as a standard work. In Canada and North America we have perhaps a practical exposition of the art of geographical surveying which is as unequalled in completeness and comprehensiveness as the country with which it has to deal is unequalled as a subject for its application. There the close association between geological structure and geographical conformation is so fully recognized that the same technical process of surveying is applied for the purpose of the double illustration. The Canadian geological survey is their geographical survey, and I think that it is to Canada (if not to India) that we owe the first recognition of the fact that geographical surveying is a separate, distinct, and most important branch of the general art, which should form the basis—the mother survey, as it were—from which all other surveys should spring. In India I am happy to think that this advance in the science of geography is now well understood. It has been more or less forced on us by the necessity for such rapid and comprehensive surveys as are required for frontier military operations, for the purposes of boundary demarcation, and for the important duty of keeping our own trans-frontier information up to the level of that of our neighbours. In our African colonies it has, alas! been discovered a little too late that geographical surveys are a sound preliminary to military operations, but, the discovery once made, it is not likely to be overlooked. Here, indeed, was presented a most forcible illustration of the danger of building up a geographical puzzle map; of piling one on to another the results of local fiscal surveys in the hope that when they were all put together they might make a good topographical guide to the country. Needless to say, the result was disastrous from the scientific point of view, and it might almost be said of it that it was disastrous from the military point of view as well. Imagine for an instant that the Canadian system of a geological survey (involving, of course, accurate topography) had been applied *ab initio* to South Africa; who can possibly say what the result might not have been by this time? The expansion of the Randt mines, for example, depends at present on local experiment carried out no doubt by most able engineers with all the knowledge of scientific mining that is to be acquired in these days of advanced specialism. But all the same I may be permitted to suggest that their experimental ventures, their tentative borings, are subject to a good deal that is almost guesswork for their application, and that a comprehensive, carefully conducted geological survey of the whole country would probably have afforded valuable indications in many unexpected directions. So also as regards schemes for local irrigation. Take the north-western part of Cape Colony, for instance, the district known as the Karoo, where the best military map existing at the time of the war did not even pretend to show the main roads through the country. The stage of development at which that part of the colony has arrived in the all-important matter of local irrigation is only worthy of the Dark Ages. It would be laughed at in Persia or Afghanistan. The Arabs of mediæval times were experts in the art of the conservancy and distribution of water in dry lands compared to the modern South African (or South American) farmer. Now, I do not say that schemes for merely local irrigation require geographical maps to support them—such schemes only require a little enterprise, a little common sense, and a little capital—but I do say that the geographical map would long ago have revealed the opportunity for comprehensive schemes, such as exist in India, just as it would have pointed out the best alignment for roads and railways, the best means for dealing with an enemy who can move 50 miles in a night, and who can make, not merely a few square miles, but a whole district the theatre of his operations. What was wanted (and is still wanted) in South Africa is what is wanted in every part of the continent subject to British suzerainty. I know that I am but echoing the urgent demand which has been made by every commissioner and governor within the limits of that vast area—not for elaborate or special maps for fiscal and revenue purposes, all of which will come in due time, but for scientific geography which shall now take the place of the preliminary work of pioneer explorers, and deal with the country as a whole instead of tracing it in outlines and in disjointed parts. In short, they require all gaps filled up. They want to know what the country contains in the way of forests, of open land suitable for agriculture, of desert and swamp, of opportunities for roads and railways, for telegraphs and irrigation, before deciding on the right position for the centre of an arterial system of public works which shall pervade in natural and orderly sequence, and in due time, every part of the body of the country of their administration. Now this is scientific geography. It is not ordnance map-making nor anything very much like it. It is a comparatively new demand on the scientific resources of England, and those resources are by no means equal to the demand. Before considering resources, however, we must look to the scientific means to this geographical end. I have already referred briefly to the subject of geodesy, and I have told you that what is termed geodetic triangulation is a function of high scientific order, demanding not only minute and painstaking care on the part of an able staff of observers, but very considerable time and very considerable expense to carry it to a satisfactory issue. I have also pointed out that, inasmuch as the exact distribution into parts of any large space of the world's area must ultimately depend on the exact measurements which are a function of only the highest class of geodetic triangulation, we must look finally to geodesy to support the framework of our geography and to give it its rightful place in the great total of the world's mapping. But the demand for geographical mapping is not satisfied with the promise of an elaborate basis for the work which has first to be constructed with the expenditure of much time and money before anything in the nature of a final map can be produced for purposes of administration. The political world, too, cannot always sit patiently through all the international disagreements, the losses, the unrest, and the positive national danger to which an unsettled boundary gives rise, whilst the geodesist works slowly through the country year after year, piling up sheaves of equations and folios of observations, but never a square mile of practical topography. As for the military department, I hardly know what to say. There is the example before us of Germans, Russians, French, and Americans, all conducting their campaigns with maps in their hands, taking every special means at their command in order to acquire such maps before they commence operations; whilst the Boers have fought us to the bitter end with a practical knowledge of the country which is even better than maps, and which is exactly that class of knowledge which maps are supposed to replace or supplement. None of them wait for geodesy.

Certainly the attitude of the military department is not one of neutrality. They would like the maps, they are even anxious to get them, but they are not quite certain that they are worth paying for. However that may be, I can only express my own conviction that geographical mapping will be found to be an urgent necessity in every corner of the unmapped world subject to British influence. We would like to wait for those accurate determinations of geodesy which would at once furnish us with the best of all possible means for commencing a comprehensive geographical survey. But we cannot afford to wait, and the great geographical problem of the age is how to reverse the natural sequence of scientific procedure and to obtain maps of the unmapped world which no subsequent geodetic operations shall condemn as inaccurate. It is not a question of expediency; it has been one of necessity for many years past; and inasmuch as necessity is the mother of invention, I think that it will finally be conceded that means *have* been found for ensuring sufficient accuracy in geographical work to render it capable of enduring the subsequent tests of completed geodetic measurement without dislocation and without interference with the general utility of the maps, even if that accuracy be not scientifically perfect.

It is not my intention to bore you with technical details. I only wish to impress upon you that in the field of scientific geography, as in other fields, "the old order changeth." We must work on new principles in order to meet new demands.

Use of the Telegraph in Geography.—One of the chief means to this end is the telegraph. Few people appreciate the important *rôle* which is played by the telegraph in these days in the field of geography. It was not so very long ago that the first stop towards regenerating a natural wilderness, or for securing access to new commercial openings or centres of uncivilized population was held to be the construction of roads and railways. Means of physical access was the first step towards the development of a country which was regarded as unenlightened from the standpoint of European civilization. It is so no longer, for the telegraph often threads its way through many a dreary waste of unpeopled earth, uncoiling its length for hundreds of miles in advance of any railway, or indeed of any road which can in the ordinary sense of the term be described as a constructed road. I will give you an illustration. On the Patagonian pampas not so very long ago, in the midst of a wide wilderness of snow, after losing our way in a blinding snowstorm and camping on our tracks for the night, we struck the end of the telegraph line which is now being pushed across Patagonia, and which will eventually connect the Atlantic with the Pacific. We had seen no roads whatever for a great part of the distance we had traversed. Our daily procedure was the simple process of following a guide over the illimitable stretches of bush-covered uplands which reach down from the eastern foot of the Andes in gentle grades to the Atlantic shore; and when we did at last fall in with the great central line of trans-continental communication we found it to consist of the wheel-marks of certain previous waggons which had drifted along that way, a sort of road which it was exceedingly easy to lose in the fading light of a stormy winter's day. On this road there was nothing but a telegraph end and the tents of a few telegraph officials, and we were some 150 miles from our destination on the Atlantic coast. And so it happened that, after weeks of absence from any means of communication with the outside world, we were thus suddenly put in possession of its very latest news; and the very first message that passed from the end of that line into my hands was the message of peace with South Africa, signed an hour or two previously. I accepted that message as a happy omen for the result of our Patagonian mission. And thenceforward (thanks to the courtesy of the telegraph chief at Buenos Aires) nightly as we sat in the snow we read all that was important from the London evening papers of that selfsame day. We were not starving by any means, but had we wanted a loaf of bread in that unbroken stretch of snow-covered bushland we certainly could not have got it; whilst here was information flowing in with a daily ease and regularity that I greatly missed when once again I was within reach of clubs and civilization. The importance of telegraphs in the field of geography, however, is not confined to the transfer of news to casual travellers. It is the facility which it places in the hands of the geographer for determining his position in longitude that renders it so important a factor in the prosecution of a geographical survey. Every one knows that the first duty of a geographer is to discover his latitude and his longitude. Hitherto the determination of the first has been a matter of no great uncertainty, but as regards the latter, one can only say that the confidence expressed by most explorers in the results of their observations has never been justified by the final verdict of subsequent determination. It is, in truth, most difficult even for the most practised observer to obtain an absolute value in longitude on which he can rely within such limits of accuracy as are essential to the construction of a map where these values have to be employed deferentially. The telegraph places in our hands the means of differential determinations within a degree of exactness that surpasses even that of the most careful determination of latitude; and the telegraph is everywhere. Supplementary to the facilities of time-signalling by telegraph is the wonderful accuracy of graduation introduced into the smaller classes of new instruments which in these days replace the cumbersome equipment of the past. With a small 6-inch theodolite fitted with a complete vertical circle, time values can be determined within a fraction of a second, and latitude values to within two seconds of arc, always provided that that great bugbear of the astronomical geographer, level deflection, does not interfere with his results. But the same minute accuracy in graduation which has so improved the ordinary little instruments which you find in the hands of the professional geographer has, when combined with new methods for accurate linear measurement, also placed it in his power to carry out a fairly coherent and systematic triangulation with great rapidity and accuracy over large areas of country whenever the configuration and characteristics of that country are favourable. Usually they are favourable. Large expanses of flat desert, of undulating veldt or of unbroken forest are the exception, not the rule, and they must of course be dealt with as their special peculiarities demand; and for the normal conditions of land configuration, given that the explorer is specially careful about his base measurements and his initial data, he can certainly with modern instruments and the facilities for check given him by the telegraph, carry on a rapid and comprehensive geographical survey which will fulfil all the conditions required by the administrator, economist, political geographer, or military commander within such limits of accuracy as will ensure its standing all the subsequent tests that geodesy may apply without any apparent map dislocation. And practically that is all that is wanted for a first map. I have used the word "rapidly." Few people (even scientific geographers) have really grasped the full meaning of the term as applied to surveys on geographical scales (*i.e.* 1 : 250,000—about 4 miles per inch, or less) under normal conditions. Such surveys can be completed quite as fast as an army can advance in the field, even granting that the advance is continuous. They can even, to a certain extent, precede that advance in face of an enemy. A single triangulator with a staff of two or three topographers in a fairly favourable country will be responsible for an outturn which may be counted by hundreds of square miles per day. The records of both American and Canadian surveys will prove that the marvellous progress made in the frontier reconnaissance surveys of India is nothing abnormal or unexpected.

Necessity for Training Schools.—So far I have spoken about the system only, a system which has been nearly perfected by experiments in Canada, Russia, India, and elsewhere. Now we have to turn from the work to the workmen. It is only lately, quite lately, that England has discovered that such workmen are wanted at all. Five or six years ago there was not a topographer nor a topography school in England. But the demand during late years has been insistent and constant, with the result, I am glad to say, that efforts have been made in various directions to start topographical schools, and a distinct change is apparent in our methods of instruction military headquarters. No purely technical central civil schools such as exist on the Continent are to be found in England, and the natural result is that at present England possesses no finished topographers and not many men who know what is meant by a geographical survey. In the wilds of Patagonia (which is, I must premise, a country beset with special climatic difficulties, but not otherwise one unsuitable to the topographer's art) I met many men of great intelligence and exceptional skill who had been gathered from various quarters for the purpose of topography. There were Italians, Argentines, Germans, French, and Swiss, but not an Englishman amongst them. Russians of the type of my old and unforgotten friend Benderski have long been famous for their skill; but although English administrators and soldiers are alike crying out for more and better assistance in the active field of topography, they cannot get it from England. The establishment of a school of practical geography such as must eventually guarantee the existence of a military topographical corps would be a matter of congratulation deserving to be noted as an important step in the advance of the geographical education of the country, no less than the school at Oxford which deals more directly with civil interests, and is rightly most concerned with the academic aspects of geographical instruction. Even this, however, is hardly sufficient. I am convinced that the recommendation which arose from certain resolutions found in the Geographical Section of the British Association Meeting at Bradford two years ago in favour of the employment of natives in Africa for African work, just as Indian natives are employed in India, is thoroughly sound. We want schools in Africa as well as in England. Only in this way will the vast areas still unmapped in our African protectorates be dealt with at reasonable cost and in a reasonable space of time.

Photo-topography.—Certain developments in the practical field of geography have lately been brought to the test of continued experimental application, and the progress of these experiments deserves a passing record. Notably the application of photography to purposes of geographical illustration has received immense impetus from the apparent facility with which the experimental media can be handled. In favour of the haphazard landscape illustrations with which we are usually deluged by travellers there is little to be said. They are far more frequently illustrations of the personal progress of the author than of the general character of the country he progressed through. Neither is there much more to commend in photographs designed to reproduce geological or tectonic features, glacial configuration, special orographical conditions, or the like unless the position of them and the direction of the line of sight from the point of view are very clearly indicated on a corresponding map. At the best they are apt to be deceptive, for the reason that they can but deal with one side of a subject and with only a partial view of the particular feature they represent. Every one knows that an apparent range, or even a system of ranges, of mountains may be nothing but the *revêtement* of a high plateau or tableland; but the photograph of such a mountain system will give no indication of the plateau beyond the range which can indeed only be determined by a survey, and properly illustrated by a map. I need hardly say that a topographical delineation of ground derived from observations made by the aid of photography demands as much technical skill on the part of the topographer and as much systematic application of the use of instruments as any other survey. It must be a combination of careful triangulation and skilful plane-tabling precisely as is the product of a topographical survey. It demands, if anything, more special training and a more elaborate method of procedure than does ordinary survey. So far as the results of experiments made over suitable fields in Canada can teach us, the verdict is in favour of the process only under certain conditions of light and climate when it is desirable to obtain a record of observations in as short a space of time as possible, either in high altitudes, when passing clouds afford but a fleeting view of the landscape, or in low-lying districts, where active tribal hostility in the field or some similar condition renders it desirable to curtail operations as much as possible. Under all other ordinary conditions it is maintained by Canadian surveyors that, although both time and labour may be saved on the field operations, the resulting map can never attain the same standard of accuracy in detail that distinguishes good topographical illustration of the usual variety of natural features. I am, of course, now speaking of geographical surveying as an art, not of mere geographical exploitation. In the latter case, doubtless every traveller who can "pull the string" in these days can add immensely to the personal interest of his journeys by his illustrations of them. But I would earnestly impress upon all travellers that if they desire those illustrations to be of any use for geographical compilation, it is absolutely necessary to know the point from which they were taken and the direction of the view.

Barometric Records.—Once again, too, would I warn travellers of the utter uncertainty of all classes of barometric determinations for altitude. Very little has been done in recent years towards improving instruments of the barometric class, and meteorological science has not yet taught us how to deal with the constant variations in air-pressure produced over local areas by changeable weather. There are some countries where barometric records can hardly be regarded as offering a clue even to differential heights. It cannot be too often insisted on that the determination of the relative heights of mountain peaks and of the local value of refraction by means of the theodolite is as much the duty of the triangulator as is the fixing of those peaks in position for the use of the topographer. From these again the altitude of positions in the plains can be safely determined by small instruments of the clinometer class without resorting to the barometer at all, although it may still be necessary to ascertain the value of one initial (or final) point which must be determined by many observations spread over a considerable length of time and synchronous with another set of observations determined at sea, or some already known, level. This, of course, will occur only when a new geographical area is opened up to survey at some distance from the sea.

Universal Mapping.—It will be remembered that a scheme was set afloat some years ago by Dr. Penck, the eminent German geographer, for the mapping of the whole world on the scale of one-millionth, which is very nearly equivalent to the scale of 16 miles to 1 inch. Substantial progress has now been made in support of this scheme by English map-makers, especially in India, where all the trans-border countries which have fallen geographically into the hands of Indian surveyors are now being mapped on this scale. In the commencement of all great colonial survey schemes, it is much to be hoped that this project for one homogeneous and universal map will not be lost sight of.

Map Spelling.—I wish that we were as well on the way towards homogeneity in spelling as we are in scale; but it is much to be feared that arbitrary rules will have to be applied to so many special localities that no universal system is ever likely to be adopted. The further that exact geography extends the more difficult becomes this problem, until at last we shall probably arrive at the conclusions adopted long ago by the Government of India, and consider it best to lay down by order an arbitrary list of prominent names, and rule that the spelling of them shall be maintained as in this list in all Government records and maps. Scientists may disagree, but after all it seems the only practical way out of the confusion that exists at present.

Terminology.—There is yet another subject of world-wide interest to the geographical student equally with the practical geographer which requires something of the erudition of the philological scholar to be brought to bear upon it in order to arrive at a satisfactory issue. I refer to the subject of geographical terminology. It may seem an easy thing to be satisfied with such general definitions as are involved in the terms "range of mountains," "coast-lines," "main channels," "watersheds," "slopes," "affluents," and the like; but when these terms, and terms similar to them, are employed in international agreements and treaties, carrying with them the necessity for identifying on the face of nature the feature which corresponds to the term employed, there is always to be found room for discussion as to what its exact meaning may be. For the variations of nature are infinite, and no two features classified under the same generic name are alike. Were I to give you examples of only a few of the geographical expressions which, carelessly used, have led up to serious international disagreements, yet would, I am assured, agree with me that it is high time that geographers all the world over came to some definite understanding about the meaning of geographical terms. To take an instance. What is a "range" or a "main range" of mountains? Where does it begin? Where does it end? How far does the term involve geological structure? When a continuous line of similar structure is split across the axis of it, does it become two ranges or does it remain one and the same range? Or, again, what is "the foot of the hills"? Is it where the steep slopes end and the talus or gentle gradients of its detritus commence, or must you follow the latter down to the nearest watercourse? If you talk of the coast-line of Western Patagonia or of Norway, do you include such headlands as are connected with the mainland at low water, and exclude the islands, or do you mean the coast-line of both? What is the main channel of a river? Is it where the flowing water scours deepest from time to time, or is it a fixture amongst a score of minor channels that shift and change? Perfect definition is of course hopeless. It is not in the power of man to deal with all the infinite variations of geographical feature and to classify them as he would specimens of botanical origin or of natural history. But we might arrive at a much more satisfactory dictionary of geographical terms in our own language than at present exists, and we might offer that dictionary to the geographers of the world at large and say, "Here we have at least endeavoured to explain our meaning when we make use of geographical expressions. This is what is taught in our schools as the best means of translating the general idea into a distinct mental conception of natural features; and in future when we use these terms you will know on the best authority that England can produce what it is that we mean by them." Then possibly, instead of having to turn to Germany and France for assistance in expressing ourselves clearly when drawing up legal documents dealing with geographical conditions, we may find the English language become the standard for this special class of literature in spite of its verbal poverty. This at any rate is what is now being attempted by the Geographical Society, which spares no effort in order to obtain the best literary assistance in its compilation that the country affords. We shall soon have a geographical dictionary, I trust, and be able to enter with a little more ease and confidence into the field of literary discussion of geographical subjects.

Progress of Geographical Education.—The progress of geographical education in the country, although it is by no means so universally apparent as might be considered desirable, yet shows encouraging symptoms of vitality in many directions.

The Civil School at Oxford, for instance, conducted by Mr. Mackinder, has already made most successful efforts to produce expert teachers of geography. Here, in addition to 208 students (of whom 163 were men) attending courses during the past year, five students have already won the Post-graduate Diploma granted by the University, and it is encouraging to note that four out of the five have already obtained distinctively geographical work. Others similarly qualified, if of sufficient ability, would probably not have long to wait for opportunities. In addition to its regular University functions, the Oxford school has this year organized a summer course of three weeks' study. This has been well attended by teachers and instructors from all parts of the country, and even from America.

In London a department of economic geography is in course of organization at the School of Economics and Political Science, and geography will become a compulsory subject in examinations. In the matter of examinations we have to hronicle the issue of a most excellent syllabus for the new London Matriculation, which should ultimately have great influence on the teaching in many schools.

Further, the "Geographical Association," a body now of seven hundred teachers, has made great progress. It has recently commenced the issue of a journal known as the *Geographical Teacher*, one of whose functions appears to be the criticism of the questions set in various public examinations.

Satisfactory progress has also to be recorded of the School of Surveying initiated by the Royal Geographical Society, now under the superintendence of Mr. Reeves. The diploma of the Society has been awarded to about 25 students, who have in all cases found suitable employment as surveyors subsequently. Indeed, the demand for trained surveyors of the Society's school already exceeds the supply, although it cannot as yet be maintained that our means of training are as perfect as we could wish.

In military schools the report of the late committee appointed to consider the education of army officers shows clearly enough that amongst all the necessary subjects for a cadet's education which have to be crammed into the exceedingly short course of his military schooling, that branch of geography which is embraced by the term "military geography" finds a very conspicuous place. The short course of a military school will never turn out an accomplished geographical surveyor; nor does it in any way outflank the necessity for a military school for professional topographers. But it teaches the young officer how maps are made, and instructs him in the use of topographical symbols. It would be well if it could be pushed a little further—if it could teach him how to make use of the maps when they *are* made—for personal experience convinces me that the apathy shown by many of our foremost generals and leaders on the subject of maps arises chiefly from a well-founded doubt of their own ability to make use of them. As for the broader basis of general geographical instruction which would deal with the distribution of important military posts and strategic positions throughout the Empire, and teach officers the functions of such positions, either individually or in combination, during military or naval operations, it is perhaps better that such a strategic aspect of geography should be relegated to a later age, when the average intelligence of the cadet has become more fully developed.

Taking it for all in all, there are distinct signs of a more general interest and more scholarly standard of thought in the subject of geography. This is probably due to the efforts of a comparatively small group of workers at a time of general educational reform, possibly partly stimulated by the disclosures in connection with the late war.

The methods of further improvement are simple—better teachers and better examining—and for both it is probable that we must look more directly to civil sources than to the tentative efforts of the military schools.

RECENT PAPERS ON THE KARST LANDSCAPE.

A NUMBER of papers have recently appeared dealing with the physical characteristics of the limestone region of the Dinaric alps, of which the Karst is taken as the typical district, and to which the Karst has given its name. Prof. W. M. Davis, of Harvard, contributes an account of an excursion made with Prof. Penck and his students to Bosnia and Herzegovina to the *Bulletin* of the Philadelphia Geographical Society (vol. iii.). It affords an excellent introduction to the study of the region, as it gives descriptions by a highly competent observer of the characteristic land-forms of the Karst, with here and there hints as to their probable history. In addition to points which are more elaborately discussed in the papers noticed below, special attention is called to remarkable waterfalls, which are due to deposition and not to erosion. These are formed by travertine laid down in the bed of the river. The falls of the Kerka and the long narrow lake-like expansion above them are the best example.

Prof. Penck has also written an account of the districts visited in this excursion. Some of the more important points in Prof. Penck's "Geomorphologische Studien aus Herzegovina" (*Zeitschrift des Deutschen und Oesterreichischen Alpenvereins*, xxi. 1900) may be noticed. The opening chapter deals with the aridity of the land, its hollowed surface, the absence of accumulations of rock waste, and the formation of the layers which compose it.

The aridity is not due to lack of rain, for over 60 inches falls on an average every year. The rain immediately disappears through the porous limestone, but flows beneath the surface, whence it may be seen to issue in gorges such as that of the Narenta, which receives few tributaries, but is nourished by waters from many springs in its bed or falling in cascades from caves above it. The Narenta is the only river which flows in an open channel to the sea. The Ombla, which appears from underground, and enters the sea near Ragusa, is fed by part of the waters of the Trebinyčica and Mušica.

The land is pitted with sunken areas, some of which are the passage-ways of surface-water underground—the smaller sinks or swallow-holes or dolines,—others exist where underground streams appear, flow, and disappear—sunken fields or polyes, which, as a rule, are much larger than the sinkholes. The polyes have usually a flat surface covered with sand or loam, rarely with gravel. Transition forms occur—for instance, the Nevesinye polye is no longer crossed by a river, but has innumerable flat sinkholes through which the water disappears. The dolines are much more widely distributed than the polyes, and are common enough in our own chalk and limestone ridges. The polyes are related in an unmistakable manner to the structure of the land. They strike north-west to south-east like the main ridges and furrows. In spring, when the rains are heavy, the drainholes become choked, the floors of the polyes are flooded, and Herzegovina becomes one of the richest of lands in lakes. These lakes are short-lived, for in summer they disappear, leaving fertilized fields, which are cultivated.

The polyes are not the only peculiar phenomena in the Karst landscape. There is an absence of a talus of waste at the mountain's base, such as is common in the limestone Alps and elsewhere. Here the wonderfully pure limestone is all dissolved by running water, and chemical erosion overpowers mechanical erosion. This is manifest in the few fragments which can be picked up, for they are all grooved and often pierced with holes. The absence of waste and of soil for plant-growth permits the structure of the land to be seen in an unusually clear way, and strata can easily be followed for miles. This makes the region one of the best for many special researches. Here is a mighty complex of cretaceous limestone, which is bent or broken in Z shapes along definite lines; raised in the north-west, sunk in the south-east; so that older rocks are raised in the upper angle of the Z in Dalmatia, and younger rocks are jammed together in the lower angle in Herzegovina.

The second chapter deals with the relation of the strata to the surface forms, denudation, the counterfeiting of accumulation forms by denudation forms, the great levelling, its age, the mosors, transmission of forms, polyes, dry valleys. The polyes, strata, and ridges strike north-west to south-east, and there is a general relation between the structure and configuration. Great denudation has taken place since the layers were folded, and the general correspondence of structure and configuration cannot everywhere be found. Foldings occurred after the early Tertiary strata were deposited, and faultings still later. Young Tertiary conglomerates tell of denudation, but no trace of well-marked valleys exists. Broad-shouldered mountains (Mosor Planina is 4365 feet high), with soft lines, and only on the sea side with any trace of steep walls, recall the contours of the Central European Highlands, except at their bases, where the seeming talus turns out to be rock (cf. McGee's observations in Sonora, Mexico, and Penck's in the Sierra de Guadarrama, Spain). The flat areas, above which the mountains rise, in which the polyes sink, may cut obliquely inclined strata, yet they are erosion plains. Such is the whole of Herzegovina, from the Narenta below Mostar to near Lyubuški. There is no evidence of marine transgression, and these plains must be accounted immense and old valley floors, the lateral erosion of the old river being now replaced by vertical erosion, *e.g.* of the Narenta, and this lateral erosion must have taken place when vertical erosion was no longer possible, and the stream had reached its base-level. The mountains are the remains of originally tectonic ridges; they look like mountains which rise above erosion plains, and we must picture the young Tertiary landscape here as one of gently undulating heights between broad plains, partly of erosion, partly of deposition. The mountains are not Davis's monadnocks, associated with some more resistant rock, but the remains of aboriginal heights, and may be called Mosors, after a name common in Dalmatia. That the mosors are relics of original heights seems certain from the false talus, which, however, represents what was once a real talus of limestone, now dissolved, but imposing its shape on the underlying rocks. The false talus is an inheritance from a real one. All the mountains are not mosors, for block mountains exist, *e.g.* Biokova Planina.

While the mosors are relics of original heights, the polyes are more recent excavations in the flat areas, and their margins must be considered fault escarpments, but, in some cases, where these slope gradually, the impression is given of a down folding (*e.g.* Mostarsko Blato). The region certainly has undergone recent crustal deformations, as the young Tertiary layers show, and the Tertiary layers remain in the polyes because they were lowered there; elsewhere they have been almost entirely removed, but occasional pebble-beds bear evidence of their former existence.

In the last chapter the Karst phenomena are traced to Pliocene times, after the central band with its mosors had been raised through faultings. This permitted new valleys to be formed, and traces of them remain in the usually dry valley between the Gacko and Nevesinysko polyes. As the ground-water level fell, the surface water sank through the extraordinarily porous rock, and made its way to the sea by courses determined by the relative uplift of the land.

Dr. Jovan Cvijič describes a number of polyes in the *Abhandlungen der K.K. geographischen Gesellschaft in Wien* (III. No. 2, 1901), and gives a final chapter on their development. Polyes are in almost all morphological characteristics only large dolines, and both were until recently explained as due to the falling in of cavern roofs. When dolines were proved to be due to erosion, the polyes were explained as valleys, but they differ from the blind valley both in morphological and hydrographical characteristics. The difficulty is to account for the parallelism between the major axis of the polye and the strike of the rock layers, and its peculiar hydrographical conditions with several independent stream outlets in the same locality. Dr. Cvijič's researches have led him to consider the uvala (*Karstmulde*) as an intermediate form between doline and polye. The uvala is a large, broad sinking in the karst with uneven floor, formed by the breaking down of the wall between a series of dolines. These uvalas possess the chief characteristics of polyes, for their major axes agree with the strike, but they differ from them in their irregular floor, and they lack the special hydrographical conditions of polyes. Transition forms, however, occur both to dolines and to polyes. The uvala may possess the beginnings of the hydrographical conditions of a polye, for sometimes in the dolines within the uvala water springs up in very wet years and inundates the floor (as at Plana, north of Bilek). On the other hand, in many polyes traces can be found of older uvalas, for their floors are not quite even, are pitted with dolines, and lack rivers (Vukovsko and Kupreško polyes). Beside the flat part, most polyes are fringed round the edge with a marginal belt, possessing uvala characteristics. In fact, in the polye denudation has gone a stage further than in the uvala.

In the Bosnian and Herzegovinian karst land two kinds of plains pitted with dolines and uvalas can be distinguished, (*a*) the high plains between the polyes, and (*b*) the low-lying plains formed by the polye floor. The upper plains are due to chemical denudation by an infinite number of small watercourses constantly altering their beds (cf. Penck in note above). When the walls between adjacent dolines are eaten away, an uvala is formed, whose bed is lowered to that of the ground water, and springs appear and form small streams. Such uvalas are but small polyes, and by the junction of several, a large polye (*e.g.* Kupreško) is formed. At first the supply of water is greater than can be run off through the sinkholes, or these may be stopped up, and the water rises in the bed of the polye and tends to level it. Most of the polyes of Bosnia-Herzegovina exhibited this lake-phase in Neogene and early Diluvial times, as the deposits show. Hence the upper denudation plains are older than those of the polye floor, which may be either river or lake levels. All three phases can be seen in the Gatačko polye.

The Neogene marls and loams are much disturbed at the margin, less so in the centre, and these disturbances show a prolongation of crustal movements after Neogene times. These are greatest along the fault lines, which usually follow the north-east margin of the polyes, the movement forcing the north-east wall of the polye inwards over the polye. The Neogene terraces on the north-east side may be 15 metres higher than those on the south-west, and the Diluvial one 5 metres; and the beds of the polyes are usually inclined from north-east to south-west, and the streams flow in this direction. Hence we may conclude (1) that the bed of the Adriatic has sunk since Diluvial times; (2) the sinking is greater the nearer the Adriatic is approached, as the relative figures above show; (3) that probably the Danube-Adriatic divide has moved to the north-east; and (4) that this sinking is not so marked in more recent times.

The fringing terraces of the polyes lead Dr. Cvijič to some interesting conclusions. The Neogene terraces contain alluvial cones which are absent from later ones, and probably are due to more active erosion in the colder and wetter climates of Glacial times, yet few traces remain of the ancient valleys. With the smaller evaporation, the water accumulated in the polyes, hollowed out to the ground-water level, formed marginal terraces, and the surplus in many cases flowed off at the surface, where traces of their courses can be found to-day. The lake in the Livanysko polye may have been 100 feet deep, but the posthumous dislocations make such estimates uncertain. Few lakes remained in Diluvial times, and those may have been 50 to 65 feet less deep. Dr. Cvijič thinks that the regular succession of post-Diluvial terraces can best be explained by secular climatic changes, and not by stoppages of the sinkholes.

A. J. H.

THE RECENT EARTHQUAKES AND VOLCANIC ERUPTIONS.

The preliminary report of Dr. Tempest Anderson and Dr. J. S. Flett, who went out on behalf of the Royal Society to examine the scenes of the eruptions in St. Vincent and Martinique, has been published in the *Proceedings* of the Royal Society (vol. lxx. pp. 423–445). The account given of the great outburst at St. Vincent, compiled after full examination of the locality and collecting and sifting of the evidence of eye-witnesses, modifies the earlier descriptions to the extent of abolishing the streams of lava, and substituting in their place streams of boiling-hot water flooding the beds of the rivers Wallibu and Rabaka, the result of the escape of the crater lake. Further, it comes out that the chief loss of life was occasioned by a "hot blast"—a "strange black cloud which, laden with hot dust, swept with terrific velocity down the mountain-side, burying the country in hot sand, suffocating and burning all living creatures in its path, and devouring the rich vegetation of the hill with one burning blast." There is nothing to show what was the velocity of the blast when it left the crater, but "After a couple of miles it was that of a hurricane or tornado. . . . At 4 miles from the crater the blast was travelling at 20 to 40 miles an hour, and rapidly slowing down. . . . When it reached the sea near Chateaubelair it came over the water with a wave before it, but it did not overturn the small boats which lay in its course." At Martinique the observers were fortunate enough to witness an eruption at Mont Pelée, the description of which concludes with the following paragraph:—

"There can be no doubt that the eruption we witnessed was a counterpart of that which destroyed St. Pierre. The mechanism of these discharges is obscure, and many interesting problems are involved. But we are convinced that the glowing avalanche consisted of hot sand and gases—principally steam; and when we passed the hill in R.M.S. *Wear* a few days later we had, by the kindness of the captain, an excellent opportunity of making a close examination of the shore from the bridge of the steamboat. The south-west side of the hill along the course of the Rivière Sèche was covered with a thin coating of freshly fallen fine grey ashes, which appeared to be thickest in the stream valleys. The water of the rivers flowing down this part of the hill was steaming hot. This was, undoubtedly, the material emitted from the crater on the night of the eruption. There was no lava. We saw no explosions of combustible gases, and nothing like a sheet of flame. We were agreed that the scintillations in the cloud were ordinary lightnings, which shot from one part of its mass to another, and partly also struck the sea beneath."

"The most peculiar feature of these eruptions is the avalanche of incandescent sand and the great black cloud which accompanies it. The preliminary stages of the eruption, which may occupy a few days or only a few hours, consist of outbursts of steam, fine dust, and stones, and the discharge of the crater lakes as torrents of water or of mud. In them there is nothing unusual, but as soon as the throat of the crater is thoroughly cleared, and the climax of the eruption is reached, a mass of incandescent lava rises and wells over the lip of the crater in the form of an avalanche of red-hot dust. It is a lava blown to pieces by the expansion of the gases it contains. It rushes down the slopes of the hill, carrying with it a terrific blast, which mows down everything in its path. The mixture of dust and gas behaves in many ways like a fluid. The exact chemical composition of these gases remains unsettled. They apparently consist principally of steam and sulphurous acid. There are many reasons which make it unlikely that they contain much oxygen, and they do not support respiration."

The *National Geographic Magazine* devotes the whole of its July number to a series of papers on the May eruptions in Martinique and St. Vincent. Mr. Robert T. Hill, after a few notes on the voyage with the *Dixie* relief expedition, describes the general geographical and economic conditions of the Windward islands, and of St. Vincent and Martinique in particular, before the present great outbreak of volcanic activity. The detailed account of the St. Pierre disaster, based on very full investigations made on the spot, brings into prominence some features of the outburst which suggested themselves as remarkable in the earlier reports. Amongst the chief conclusions reached by Mr. Hill, we may mention the following:—(1) The thirty thousand people of St. Pierre were exterminated within a few minutes and the town set on fire by the sudden eruption of a volcanic cloud; (2) the fatal cloud came from the lower vent, 2 miles north of the city; (3) the vapours coming from the volcano were and are sulphureous; (4) there was force accompanying the eruptions of the morning of May 8 of great destructive nature, which left much evidence that the gases within the cloud exploded after having reached the air; (5) the summit eruptions were and are accompanied by tremendous electric phenomena; (6) a great magnetic storm accompanied the eruptions of May 8, which was recorded at remote points, and which indicated a connection between them and the volcanic eruptions. The presence of sulphureous gases is inferred from the fact that "every metal relic susceptible to sulphur discoloration showed its blackening effect." It appears that the destructional force was aerial, not terrestrial, and "it is impossible to conceive that this force was initial from the volcanic vents, 2½ and 5 miles distant." The action of the force was apparently radially from a centre situated near the north end of the city, and there is evidence of a "return force" and of a great reduction of air-pressure on the perimeter of the devastated area.

The second paper consists of a letter from Prof. Israel C. Russell, covering a good deal of the same ground, but referring at greater length to the eruptions in St. Vincent. The rest of the number is devoted to a paper on the volcanic rocks collected by Messrs. Hill and Russell, by J. S. Diller; a chemical discussion of analyses of volcanic ejecta from Martinique and St. Vincent, by W. F. Hillebrand; and to a compilation of reports of vessels as to the range of volcanic dust, by James Page.

These reports, which together form a unique contribution to our knowledge of volcanic phenomena, show that the eruptions in Martinique and St. Vincent were of similar type, that in St. Vincent being apparently the more extensive and violent of the two, and expending a greater part of its total force in a vertical direction into the upper atmosphere. They further agree in concluding that the chief damage and loss of life was occasioned by the remarkable hot blasts, with their accompaniments of incandescent sand and the black "cauliflower" cloud, reminiscent of the mammary or "pocky" cloud of Clouston. Both indicate that the hot blast consisted of a mixture of air, steam, and a gas containing sulphur, probably sulphuretted hydrogen in the first instance, although apparently direct evidence on the point is still wanting. The great problem for investigation, however, is the dynamics of the hot blast. The phenomena in St. Vincent described by Drs. Andersen and Flett might possibly be the direct result of an explosion in the crater, like the effect of firing an immense cannon along the ground, but even there such an hypothesis is not wholly satisfactory, while in Martinique it does not seem to account for the facts, especially as described by Mr. Hill. The motion of translation of the cloud was probably complicated by the mixture of gases composing it being in parts inflammable, in parts possibly explosive, and it was likely to be accompanied by vertical movements of an obscure nature, resembling those of a tornado.

In relation to the eruption of Mont Pelée, on May 8, Dr. L. A. Bauer contributes a paper on the magnetic disturbances to *Terrestrial Magnetism.* The hour of the greatest disturbance observed at the stations of the Coast and Geodetic Survey coincided with the destruction of St. Pierre; the element chiefly disturbed being the horizontal intensity. A number of magnetic disturbances of the same character have been recorded on other dates, some preceding the great eruption, and others, notably one on May 20, coinciding with the later outbursts. Other papers which should be mentioned have appeared in *Petermann's Mitteilungen* for June, in the *Revue Générale des Sciences*, in the August and September numbers of the *Century Magazine*, and in the *Strand Magazine* for September.

Since the notes on the West Indian eruptions, published in the July number of the *Journal*, were written, there has been an almost continuous succession of reports of volcanic and seismic disturbances from various parts of the world. According to a letter from the superintendent of the Eastern Telegraph Company at Banyuvangi, in Java, published in *Nature*, the Rooang volcano, 35 miles to the west of Banyuvangi, threw up large columns of vaporous cloud from May 1 to May 4. Magnetic disturbances at the time of the Mont Pelée eruption have also been reported from Oahu island, in the Sandwich group, and the Kilauea volcano erupted violently on June 3. On June 19 Mont Pelée ejected quantities of mud, and on the same day it was reported at Calcutta that the Himalayas had been shaken by an earthquake throughout their whole length. An earthquake was reported from Calabria on June 22. A severe earthquake occurred at Salonika on the afternoon of July 5, the shock being recorded at Birmingham. Slight shocks were felt at Cheadle on July 8. On July 9 an earthquake occurred at Bandar Abbas, and shocks were felt in the Persian Gulf on July 9 and 10; the centre of disturbance was apparently Kishm island. On the same day occurred the eruption of Mont Pelée witnessed by Drs. Anderson and Flett, and loud detonations from La Soufrière at St. Vincent were heard at St. Thomas and Barbados. Another eruption of Mont Pelée occurred on July 12. On July 17 strong earthquakes occurred at Kingstown, St. Vincent, the most violent, at 9.45 a.m., being accompanied by loud rumbling sounds. It was reported that the ridge between the two craters of the Soufrière had collapsed, blocking the throat of the crater. Up to July 31 two slight eruptions of the Soufrière occurred, and a cable ship reported that at a point 18 miles to the northward the depth of the sea had increased to over 1000 fathoms. Other reports announced the opening of a crater in the Pico de Europa mountains in Spain, from which clouds of steam issued; a submarine eruption off Horta in the Azores, and unusual activity in the volcanoes of Costa Rica. On July 27-28 earthquakes occurred in Nebraska, Iowa, Southern Dakota, and California; between the 27th and 31st no fewer than seventy-five shocks were recorded in Southern California alone. On August 3-4 earthquake shocks were felt at Leiria, Portugal, and on the night of the 4th at Carrara. On August 10 an earthquake was recorded at Skagway. About August 13-15 the island of Tori Shima, between Japan and the Bonin group, was overwhelmed by an eruption; the island was reduced to ruin, and all the inhabitants, numbering about one hundred and fifty, perished. Mont Pelée showed renewed activity on August 15, and on August 21 was in violent eruption. Next day, Mont Altomonte in Calabria erupted; seismographs in the Isle of Wight, and in Hungary and Alsace, were disturbed, and shocks felt near St. Petersburg. According to a telegram from General Chaffee to the United States War Department, four hundred shocks were experienced in the Philippines between August 21 and 25. On the night of August 25 Mont Pelée again erupted, and immense quantities of dust were ejected, dust falling in Dominica, where loud detonations were heard. Another violent eruption of Mont Pelée occurred on

August 28, and three paroxysmal outbursts on August 30. Morne Rouge and Ajoupa Bouillon were destroyed, and many lives lost: it was impossible to reach St. Pierre from the sea. On August 30 a violent earthquake occurred at Carupano, Venezuela, accompanied by rumblings and noises which were heard for great distances. An earthquake was reported at Gubbio, Italy, on September 1. On September 3 Mont Pelée was again in eruption, and on the 4th the Soufrière at St. Vincent, after being almost quiescent from May 18, broke out afresh. On the 8th earthquake shocks were experienced simultaneously at Pau, Saragossa, and San Sebastian, and it was reported from Calcutta that serious disturbance had shaken the whole of the alluvial basin of Assam and Chittagong. Vesuvius and Stromboli were active on September 10, and a telegram from Seattle stated that the volcanoes Redoubt and Iliamna, in Alaska, were sending forth clouds of smoke and steam. A telegram from Kingston, dated September 17, stated that both craters of the Soufrière had been active since the 11th.

The general impression conveyed is that the northern end of Martinique is doomed; steps are already being taken by the French Government with a view to its possible evacuation. St. Vincent, and possibly other islands of the West Indies, are in some danger of destruction, while the general disturbance of the earth's crust gives signs of increasing and becoming more widely spread.

H. N. D.

THE ARCTIC EXPEDITIONS—RETURN OF SVERDRUP, PEARY, AND BALDWIN.

From the full account of the programme laid down by Captain Sverdrup on his departure, which was published in the thirteenth volume of the *Journal*, it will be remembered that the central object of the expedition was to complete the exploration of the northern coast-line of Greenland, and to set at rest the question whether that coast formed the termination of land in this direction, or whether it was succeeded to the north by groups of islands such as have been found in so many parts of the polar area. The possibility of adding to our knowledge of the ice-conditions of the far north on the American side, where some have supposed the ice to be more stationary than it has been found to be on the opposite half of the polar basin, was also kept in view. The news received in the autumn of 1899 showed that the conditions during the first season had been unfavourable to the attainment of a high latitude on the Greenland coast, the *Fram* having been caught by the ice in the vicinity of Cape Sabine, where the expedition had been forced to winter, the enforced stay in this comparatively low latitude being utilized for the exploration of Ellesmere land. Captain Sverdrup still hoped to carry out a survey of northern Greenland, proposing to undertake a sledge-journey if necessary, and send the *Fram* round to meet his party on the east coast. In the absence of authenticated information, it has therefore been thought probable in some quarters that the expedition had made its way to East Greenland, and would eventually be heard of in that quarter. Sir Clements Markham, however, in a memorandum recently drawn up on the probable position of the missing explorers, maintained the view—which now proves the correct one—that the *Fram* made its way by Jones sound to the unknown region north of the Parry islands.

Captain Sverdrup, in a telegram to the *Times*, has given an outline of his four years' experiences, of which the following is a summary:—

During the first winter the innermost part of the fiord formerly known as Hayes sound was partially explored and mapped, and a hut built, which it was proposed to transport to Robeson channel or some point still further north, to serve as winter quarters and the starting-point for a sledge expedition round northern Greenland to Sabine island. Early in 1899 two sledge journeys were made across Ellesmere land to the west coast: one leading over ice, the other—more to the north—over non-glaciated country. The mapping of Hayes sound was also completed. The summer, however, again proved unfavourable, and, it having been found impossible to take the *Fram* north, it was decided to attempt the route *viâ* Jones sound, south of Ellesmere land, discovered by Baffin in 1616 and traversed for some distance by various explorers during the nineteenth century, but never before followed to its point of junction with the polar sea beyond. An interesting field for exploration therefore lay in this direction. Quarters for the winter of 1899–1900 were taken up on the south side of Ellesmere land in 76° 29′ N., 84° 25′ W., and reconnaissances made of the coasts of the sound, which was found to run further west, without turning north, than had been supposed by Inglefield in 1852. A depôt of stores was established, and preparations made for sledge expeditions during the following spring. A preliminary trip early in March showed that open water with drifting ice already existed in the sound between North Kent island and Ellesmere land. The main expedition left the ship in two parties on March 17 and 20, all starting together from the depôt (named by the explorers Björneborg) on the 23rd. The rugged nature of the ice made travelling difficult, while a temperature of −44·5° Fahr. was experienced. A return party having been sent back on the 31st, the exploration was continued by two parties of two men each. A large bay 100 miles broad was found to run east from the neighbourhood of North Kent island, with complicated ramifications to the north. Fifty miles further west the land trends north and north-west, and is very hilly and intersected by fiords. In spite of fog and severe weather, Sverdrup and his companion Fosheim reached 81° N., then returning to Björneborg, which was reached on June 2. Isaachsen and Hassel travelled west, reaching a new land in 98° W., and then, turning south and east, traced a large system of fiords to about 79° N., the land being here very low. Other explorations, chiefly geological, were carried out by a third party, as also by the return party of the main expedition.

During the leader's absence the *Fram* had narrowly escaped being entirely destroyed by fire, but fortunately water was at hand in sufficient quantities to extinguish it. Early in August the ship was free of the ice, and steamed west on the 9th, but was again held fast from the 16th to the same date in September, after which the *Fram* proceeded through Cardigan strait and went into winter quarters in 76° 48′ N., 89° W. An attempt was made by Sverdrup to reach the large fiords to the north, but it was frustrated by a violent storm.

After a very stormy and cold winter, parties were sent out in March to lay down depôts, the weather being still boisterous and intensely cold, the thermometer falling even below −58° Fahr. The main expeditions set out on April 8, 1901, Sverdrup going north in search of a passage between Ellesmere land and the lands discovered the previous year, while Isaachsen again went west. The northward route brought the leader (apparently in part by a land passage) to the system of fiords traversed in 1900, which were followed to 80° 30′ N., where the land was found to trend westward, bad weather then necessitating a return. The western explorations disclosed, in about 78° N., a sound separating North Cornwall from another land to the north. Pushing on in this direction, Sverdrup reached a point in 79° 30′ N., 106° W., where the land trended east and south, none being visible either to the west or north, but only rough polar ice. The return was made by the south and east, so that the islands discovered were explored all round.

Among other explorations carried out during this summer was one of North Devon by a boat expedition. The ice conditions were very unfavourable, and when towards the end of August the ice round the vessel still resisted all attempts at blasting a passage, it became evident that another winter must be spent in the same quarters. In the following spring the principal attention was devoted to the region extending north to Aldrich's furthest point on Grinnell Land. This, however, was not reached, the turning-point being in 81° 37′ N. The north coast of North Devon was also explored, and a sledge excursion made to the British depôt on Beechey island, which was found to have been destroyed. Various work was done during the summer, and the *Fram* was finally able to start on the homeward voyage on August 6, reaching Godhavn on the 18th. Owing to a mishap to the machinery the greater part of the voyage thence was made under sail only.

Although fuller details must be awaited before the exact nature of the geographical discoveries can be comprehended, it is evident from the above that some really good work has been accomplished, which will throw light on a portion of the American polar archipelago lying off the routes of the various Franklin search expeditions of the middle of last century.

After an absence in the Far North of over four years, the whole of which have been spent in strenuous exertions in the cause of polar discovery, Commander Peary has at last returned to civilization, unsuccessful, it is true, as regards a near advance to the Pole, but having accomplished an amount of good work in the face of great obstacles, which has certainly enhanced his previously high reputation as an intrepid and persevering explorer. The *Windward*, which, as will be remembered, after undergoing a thorough refit, sailed north in June last on its final voyage to open communication with the expedition, arrived at Sydney, Cape Breton, on September 16, bringing the leader and all his party in good health, in spite of the many dangers and hardships to which they have been subjected in their fight with the adverse conditions of the northern polar sea. The attempt to push northward over its icy wastes had been renewed during last spring; but though Peary's previous record of 1900 was passed by over half a degree of latitude, the advance had to be abandoned while still over 5° separated the explorer from his ultimate objective—the North Pole.

Before giving the details of the last season's work, so far as they have yet been made known by the telegraph, it may be of interest to briefly sketch the course of the expedition from its first start in 1898. Rarely has greater forethought been bestowed on the organization of an exploring expedition, the main outlines of the four years' programme having been laid down before the start was made, while the need of a system of communication with the advance party by means of yearly relief expeditions was recognized at the outset, and admirably provided for through the efforts of the explorer's supporters in the Peary Arctic Club. The *Windward*, presented for the purposes of the expedition by Mr. Alfred Harmsworth, sailed from New York in July, 1898, an auxiliary ship, the *Hope*, having sailed earlier with stores. The *Hope* returned from Etah, on Foulke Fiord, in August of the same year, while the *Windward* went into winter quarters near Cape Hawks, on the coast of Southern Grinnell Land. During the first winter the task of transporting the stores to the advanced base at Fort Conger was actively prosecuted, the leader suffering severely from frost-bite during the journeys made with that object. Geographical work of some importance was also done early in 1899 on the coast of Grinnell Land, where the series of fiords running into the land between Cape Sabine and Cape Hawks was thoroughly explored, and the absence of a passage to the west demonstrated. During July of that year the first relief party sailed in the *Diana*, reaching Etah after a rapid passage, and returning with the *Windward* after handing over a fresh consignment of stores to the explorer.

The first attempt at a northward advance beyond the limits of the known was made early in 1900. The whole expedition was at Fort Conger in March, and a start was made along the North Greenland coast about the middle of April. As will be remembered, it proved impossible to advance beyond the latitude of 83° 50′ (itself a record for the western hemisphere), owing to the unfavourable condition of the ice, but valuable geographical results were gained through the charting of the whole coast of North Greenland to the neighbourhood of Independence bay, discovered by Peary during his land expedition of 1891–92. The winter of 1900–1901 was passed in the far north, and communication was therefore not effected with the *Windward*, which, after being thoroughly overhauled, had sailed in July, 1900, with fresh supplies, taking up also to the base at Etah the explorer's wife and daughter. The *Windward* wintered in Smith sound, whither Peary made his way in June, 1901, after an ineffectual attempt, in company with his servant Henson and one Eskimo, to again push north. The relief expedition of 1901, in the *Erik*, was met with in August, the two ships then returning south, and leaving the explorer prepared for a final dash north in the early part of the present year, while it was arranged that the *Windward* should once more sail north during the summer to convey the explorers back to civilization.

From the brief accounts yet received, it seems that the last winter was spent at Payer harbour, near Cape Sabine, where the *Windward* had wintered the year before. Here sickness broke out among the Eskimo, proving fatal to six adults and a child. They were at last replaced, and a start was made for Fort Conger in March, the final advance being begun from Cape Hecla on April 1, with Henson, four Eskimo, and six sledges. Lanes of young ice were constantly encountered, while as time went on open leads and floes in motion were met with, the pressure-ridges being also on a larger scale. Progress became more and more difficult, fogs being added to the other hindrances, and at last, in 84° 17′, a higher latitude than had previously been attained in the western hemisphere, the advance had to be abandoned. Cape Hecla was reached on April 29, and the return journey continued to Payer harbour, where the *Windward* arrived on August 8. Lieut. Peary is reported to maintain that ice-travel presents no greater difficulties in the extreme north than it does south of 80°, and that with a sufficiently advanced base—an impossibility in his case through want of adequate means—there should be no insuperable obstacle to an advance to the Pole. No land was seen north of Greenland, the northern coast of which is held to mark the beginning of the polar basin.

Though no startling discoveries have been made, the scientific work of the expedition is said to have produced valuable results, and the exhaustive study made by the leader of the Eskimo of the far north, a race whose habits are certain to be much modified in the future, is stated to be of great interest.

The system of relief expeditions organized in connection with Peary's undertaking has kept the civilized world fairly well supplied with information as to the course of the expedition, one season only, that of 1900, having passed without the arrival of news respecting the year's progress towards the final goal. Far otherwise has it been with the second expedition of which we have to speak—that of Sverdrup in the *Fram*—which has from the first depended on its own resources, and of the doings of which the news received during its four years' absence was exceedingly scanty. Since the autumn of 1899 we had, in fact, been in complete ignorance of the fate of the vessel and its crew, and it was only natural that a certain degree of anxiety had for some time been felt by the friends of the gallant explorers. This is now happily dissipated by the announcement, made only two days later than that of Peary's return, that the *Fram* and her crew had safely reached Norway, after accomplishing much valuable work in the little-known region to the north of the American archipelago and west of Smith sound.

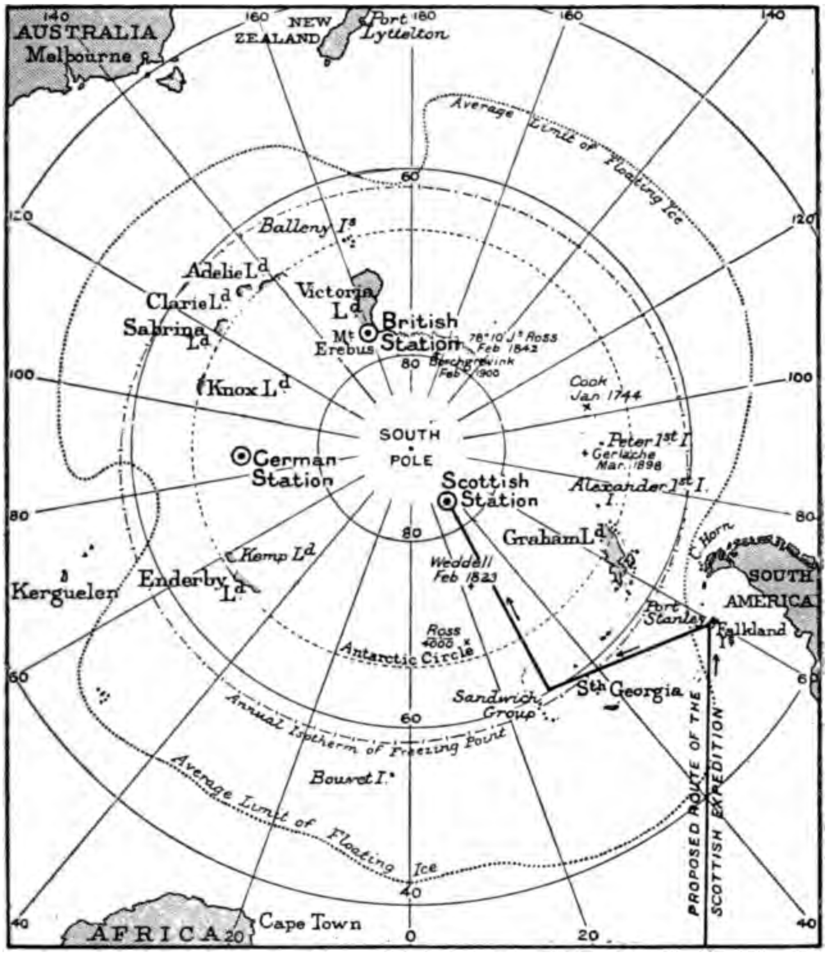
The return of the Baldwin-Ziegler Expedition by the Franz Josef Land route has been already recorded in the *Journal*, but some additional details have since been communicated to Reuter's agency by the leader, who has now reached this country. As the primary reason for his failure to reach a high northern latitude, he assigns the forbidding character of the ice in the archipelago during the autumn of 1901, which prevented the *America* from reaching a point far enough north to be of practical advantage as a base for the sledge-parties. A further serious obstacle was the sickening and death of many of the dogs from internal parasites, which ultimately proved fatal to nearly half the pack. Mr. Baldwin considers that good work has been done in the establishment of four large depôts, for which it was necessary to cover the same ground at least ten times. By the help of these it will now be possible to despatch parties from Rudolf Land without it being necessary to risk a ship in a higher latitude than that of Camp Zeigler. The *America* was set free on June 8, and this compelled the use of the reserve supply of coal at least six weeks earlier than had been anticipated, the ship being menaced by a fleet of drifting icebergs. The fifteen balloons sent up during the course of the expedition each supported a string of buoys containing messages, which would be automatically released on touching ice, land, or water. It is probable that the balloons have been driven on to the great field of ice which this year blocks the entire east coast of Spitsbergen, entirely preventing navigation in the western part of the Barents sea. Their recovery should supply valuable information respecting the currents of these seas. The homeward voyage of the *America* was a long-continued struggle with the ice.

The expedition, Mr. Baldwin states, has yielded valuable results from a scientific point of view, especially in the direction of meteorology. The collection of photographs and kinematographs brought home is quite unique, while from a strictly geographical point of view, something has been done to increase our knowledge of the archipelago, the various channels having been repeatedly traversed in the search for a passage for the ship, while several new islands have been placed on the chart. Mr. Baldwin still believes in the possibility of reaching the pole by a sledge expedition from Franz Josef Land, and is proceeding to New York to consult with Mr. Ziegler as to the future plan of operations.

THE SCOTTISH NATIONAL ANTARCTIC EXPEDITION.

The object of the Scottish National Antarctic Expedition, which will start for the south at the beginning of October, is to specialize in oceanography and meteorology, and its sphere is to the south of the South Atlantic ocean, between the Swedish and German expeditions. It is proposed to reach as far south as is compatible with the attainments of the best results to science. It is not intended to allow the *Scotia* to be frozen in the ice. There are not sufficient funds for a wintering party. The plan will be to spend the first summer and autumn in the Far South, well within the limit of the ice, and there to sound, trap, trawl, tow net, carry on meteorological, magnetical, and general geographical observations. During the winter a retreat will be made to the north outside and up to the limit of the polar ice. If funds allow, a third cruise will be made during the second summer to complete the work begun during the first; and if more money can be obtained a wintering party will be left to carry on scientific investigation for twelve months. The expedition will be absent for about one to two years, according as the funds permit.

The ship of the Scottish Antarctic Expedition was formerly a whaler named the *Hekla*, now rechristened the *Scotia*. The vessel has been so thoroughly overhauled that she is practically reconstructed, and is as good as a new ship. This work has been carried out by the Ailsa Shipbuilding Company, Troon, under the guidance of the eminent naval architect, Mr. G. L. Watson of Glasgow. She is a barque-rigged auxiliary screw steamer of about 400 tons, having a length of 140 feet and breadth of 29 feet, and drawing about 15 feet of water. With her new engines and boiler it is expected that a speed of fully 7 knots will be attained.



Sketch showing Proposed Route of the SCOTTISH ANTARCTIC EXPEDITION.

The leader, the captain, and the scientific staff are accommodated in an after-deck house, the officers in a comfortable cabin amidships, whilst the crew are quartered forward in the fo'c'sl, which is not the least luxurious part of the ship. Simplicity has been aimed at, but at the same time necessities have not been neglected. The scientific work will be carried on in a deckhouse amidships, the after part of which forms the galley. Here there is good light for those who have to undertake delicate work, such as that with the microscope, hydrometer, and other delicate and finely graduated instruments. A second laboratory, mainly for zoology, lies almost immediately below the upper one, 'tween-decks, and is reached directly from the upper laboratory. Adjacent to this is a compact and completely fitted dark room for photography. 'Tween-decks also will be found two great drums each containing 6000 fathoms of cable, each of which weighs 6 tons; this cable is led up on deck to a specially constructed forty horse-power steam winch, and from thence over the side of the ship by means of a derrick for the purpose of trawling and trapping in the greatest depths. The roof of the scientific deckhouse and its extension in the form of a bridge is where all the operations connected with the sounding and physical investigation of the ocean take place. Aft, on the poop, is the instrument which secures and hauls in, by a special motor engine, huge kites which suspend meteorological instruments at great heights in the atmosphere. This machine, as well as all the hydrographical machines, can also be driven by a special horse-power engine which is capable of hauling up instruments from the depth of the sea at the rate of 80 to 100 fathoms per minute.

The leader of the expedition, Mr. W. S. Bruce, has had an almost unique experience of polar exploration. He was one of the scientific members of the Dundee Expedition to the Antarctic in 1892–93; took part in the Jackson-Harmsworth Expedition to Franz Josef Land, and Captain Andrew Coats' Expedition to arctic waters; and has twice accompanied the Prince of Monaco to Spitsbergen. The captain of the *Scotia* is Captain Thomas Robertson, of Peterhead, who has had over twenty years' experience in arctic navigation, and made a voyage ten years ago to the antarctic regions. He has found the time and shown the interest which has enabled him to make important geographical discoveries, and has never lost a ship nor a man. The scientific staff, in addition to the leader, consists of half a dozen picked scientists, four senior and two junior men. Mr. R. N. Rudmose-Brown is botanist, and will investigate the small oceanic "plankton." He is a graduate in science of Aberdeen University, and is chief assistant to the Professor of Botany, University College, Dundee. He has also had experience at Kew, and in the British Museum under Mr. George Murray. Mr. R. C. Mossman is the meteorologist and magnetist. He has taken a course in magnetism at Kew Observatory. For fourteen years he directed the chief meteorological observatory in Edinburgh, and more recently one in Glen Nevis, and on several occasions has acted as superintendent at Ben Nevis Observatory. In addition he is the author of about fifty papers on meteorological subjects, the most notable being his monograph on the climate of Edinburgh in the *Transactions of the Royal Society of Edinburgh.* Dr. J. H. H. Pirie is geologist and medical officer. He is a graduate in science and medicine of Edinburgh University. He has worked at deep-sea deposits in the *Challenger* office under Sir John Murray, and has been trained in field-work with the members of the Geological Survey of Scotland. He served with the Imperial Yeomanry in South Africa with distinction, and was promoted to a lieutenancy in the Royal Field Artillery. Mr. Bruce and Mr. Wilton undertake the zoological work. Mr. Wilton has a wide experience of arctic life and work, having spent several winters in the north of Russia, which enabled him to become an expert ski runner and an adept in all that pertains to sledging. In 1896 and 1897 he joined the Jackson-Harmsworth Expedition to Franz Josef Land, and there assisted Mr. Bruce in the zoological work. Thereafter he returned to Edinburgh, studying at the University and Royal Colleges, attaining distinction in zoology and botany. During his vacations he has acted as an observer at the observatory on the summit of Ben Nevis, and has since taken part in an expedition to Turkestan and Western China, whence he returned with collections which materially added to our knowledge of the fauna of these countries. Two younger men will probably accompany the expedition as artist and taxidermist respectively. It is hoped that a bacteriologist will accompany the expedition.

REVIEWS.

AFRICA.

THE AZORES.*

THIS admirable study is divided into two main parts. Besides a general summary of *Notions geographiques sur les Açores*, a history of the discovery is given (subdivided into *La connaissance des Açores . . . jusqu'au XIV^e siècle*, *Les Açores sur les Portulans*, and *Découverte et Colonisation des Açores par les Portugais*), and an inquiry is added into the Flemish connection with this archipelago and its names of *Vlaemsche Eylanden*, *Insulae Flandricae*, *Iles flamandes*. The Flemish colonization at San Jorge and Terceira, and especially at Fayal, is specially examined in detail, and the story of a Flemish (pre-Portuguese) discovery of the Azores is discussed and rejected.

In an appendix valuable extracts, indispensable for a proper study of the subject, are made from the 83rd chapter of Azurara's *Chronicle of the Discovery and Conquest of Guinea* (A.D. 1445; p. 389 of Santarem's text), from Diego Gomez's extremely important and long-neglected *De inventione insularum de Açores*, and from the charters of Alfonso V. (July 2, 1439; March 10, 1449; April 5, 1443; April 20, 1447; January 20, 1453). A most useful comparative table is added of the Azores, as they appear in various Portolani, from the Laurentian or Medicean Portolan of 1351 to the George Calapoda of 1552.

The result of Dr. Mees' examination is greatly to discredit Father Cordeiro's *Historia Insulana*, on which almost all studies in the eighteenth and nineteenth centuries have been based. On the other hand, it is suggested that Diego Gomez, our only contemporary historian besides Azurara (who in this matter offers no decisive evidence), gives us the true account of the Portuguese re-discovery.

Now, according to Gomez, the islands of St. Michael, Terceira, Fayal, and Pico, together with a fifth unnamed, were apparently found, not in a series of ventures, but in a single voyage, by the enterprise of Prince Henry the Navigator, who desired to seek out lands beyond the furthest ancient limits. (*Tempore quodam* Infans . . . Henricus, cupiens scire partes extraneas Oceani occidentis, si invenirent insulas an terram firmam ultra descriptionem [P]tolomei, misit caravelas. . . .)

Martin Behaim's account, though loaded with inaccurate and misleading additions, is at bottom that of Gomez, and thus, so far as the discovery is concerned, preserves a truer record than Cordeiro. As to the year of the first Portuguese visit, and the name of the pioneer, Dr. Mees, in deciding between various readings of the famous inscription on the Valsequa (or Valsecca) portolano of 1434–1439, reads with Tastu, "*Aquestas illes foran trobades p. Diego de Sivilla pelot del Rey de Portogall an layn* MCCCCXXXVII." On the other hand, the Columbus Centenary Commission of 1492, under J. G. Imaz, appointed by the Spanish Government to examine and facsimile the Valsequa map, read ". . . *Diego Sunis . . . lany* MCCCCXXII." The damaged condition of this important legend makes the reading a matter of great difficulty and uncertainty; nothing is satisfactory here except a personal investigation of the original; it is of little use to study the discrepant reconstructions of others. Personally, we must confess a strong preference for the date-reading given by Pasqual, Rosello, and d'Avezac (MCCCCXXVII.).

As to the alleged grant of the Azores in 1466 by Alfonso V. to his aunt Isabel, wife of Philip the Good of Burgundy, Dr. Mees—surely with justice—

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* 'Histoire de la découverte des Iles Açores,' etc., par Jules Mees (Gand, 1901), pp. 143, with reproductions of six maps of the Azores.

rejects it utterly. At most he only admits that the Duchess of Burgundy exercised a certain influence in the colonization of Fayal, the "Flemish island" *par excellence,* and that it was probably owing to her influence that Josse de Hurtere became the Captain Donatory of Fayal. Prince Henry's heir, the Infant Dom Fernando, may well have invited the co-operation of the duchess in settling this part of his inheritance, but he certainly did not divest himself of his rights in her favour. It is singular that Major, while attaching so high a value to Diego Gomez in reference to the Cape Verde islands, made so little use of his evidence as to the Azores. On the other hand, the mention of these islands in the *Conosçimiento* of *c.* A.D. 1330 has only been known since 1877; their occurrence on the Medicean or Laurentian Portolano of 1351 has long been known to, though strangely neglected by, scholars.

In reading this valuable essay of Dr. Mees', constant reference should be made to the comparative reproduction (at the end, on one sheet) of the Atlantic islands as they appear in the Dulcert of 1339, in the Laurentian map of 1351, in the Soleri Portolan of 1385, in the Andrea Bianco of 1448, in the Catalan map of the middle of the fifteenth century, and in the Soligo of 1455. In the first-named there is no clear evidence of the Azores; in the next five we can trace the slow cartographical development of the archipelago from the germ of the *insule de corvis marinis,* as given in 1351.

AUSTRALASIA AND MALAYSIA.

THE MALAY ARCHIPELAGO.*

The Malay archipelago, through the fascinating beauty of its islands, lying in a blue pacific sea under the azure skies of the summer of the world, from the diversity of its flora, its fauna and its peoples with their varying manners and customs, and from the extensive regions within its vast boundaries which still await the gladdening eye of the explorer, presents attractions to the geographer, the naturalist, and the ordinary traveller which cannot be surpassed in any other region of the globe. Year after year it draws to its shores a succession of visitors of all sorts and conditions, and as a consequence we have a constant stream of works describing what of astonishment, delight, or instruction has been garnered by their authors in their wanderings in this wonderful region. We have a quartette of such books before us. Dr. Giesenhagen, the professor of botany in the University of Munich, visited the western portion of the Indian archipelago as a delegate from the German Government, to collect seeds and living specimens of such useful and commercially valuable tropical plants as would be suitable for the German colonies, especially gutta-percha, and to make himself conversant with their growth and cultivation, and to study certain botanical questions which could only be solved in their tropical home. His investigations led him naturally in the first place to the botanical gardens in Buitenzorg, then into West Java and the Preanger Regencies, thence to Sumatra, which he crossed from Palembang to Benkulen—one of the most delightful journeys which it is possible to take in the world (more especially, perhaps, if it is traversed in the reverse direction, when one can glide for days in a boat, or on a raft for preference, with, instead of against, the stream of the great rivers which traverse the wide eastern plain),—for Nature is encountered in every conceivable mood, virgin forests full of giant trees, lofty and picturesque mountains, active volcanic peaks, great rivers, pleasant cultivated regions, interesting people everywhere, and a land withal as safe as any part of Europe. From Benkulen Dr. Giesenhagen traversed the Padang highlands and Atjeh, and *viâ* Penang he reached the tobacco plantations of Deli, thence he returned with his collections to Europe. The same route was practically followed by the venerable biologist, Haeckel, who in 1890 undertook the journey to these Eastern Isles, for the purpose of collecting further observations on the marine plankton, so that he might bring to a completion the long and successful studies which he had devoted to these *Protista* for the great space of forty-six years. In his letters from *Insulinde* he gives a chatty account of his trips into various districts of Java (Buitenzorg, the Preanger Regencies, with its volcanoes and Hindu remains) and of Sumatra (the Padang lowlands and highlands). In the 'Emerald Isles of the South Sea,' Dr. A. Pflüger describes a *Rund-reise* in one of the steamers which periodically navigate the archipelago. Starting from Atjeh in northern Sumatra, he touched at all the important ports in most of the islands as far east as the "outposts" of German New Guinea; but the length of his excursions from the shore were limited by the duration of his steamer's stay in a port, which was rarely more than a night. The additions to our previous knowledge of the districts visited by these three travellers could, under the circumstances, hardly be expected to be extensive. Indeed, they specially disclaim any credit for original observations; but being men of superior culture their "plaudereien" are always interesting and suggestive. Prof. Haeckel's 'Reisebriefe' is full of personal reminiscences, sometimes rather discursive, and, as might be expected, it is elevated above ordinary books of travel by containing abundance of philosophic observations upon the men, animals, and plants which give interest and attractiveness to the scenery through which he passed, which delighted him by its unusual beauty. All three volumes are illustrated by specially fine process blocks from photographs or water-colour drawings, and by good maps. Strange to say, however, not one of them contains an index, an omission too common in German works, and unpardonable in an author nowadays. The cover of Dr. Griesenhagen's book is most appropriately ornamented with the batek-ed pattern of a Malay *sarong*, or petticoat.

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* 'Auf Java und Sumatra.' Von Dr. K. Giesenhagen, A. o. professor der Botanik an der Universität München.

'Aus Insulinde: Malayische Reisebriefe.' Von Ernst Haeckel.

'Smaragdinseln der Südsee. Reiseeindrücke und Plaudereien.' Von Dr. Alexander Pflüger, Privatdozent an der Universität Bonn.

'Nelle Foreste di Borneo: viaggi e Ricerche di un Naturalista.' Odoardo Beccari.

To a far higher category appertains Dr. Beccari's 'In the Forests of Borneo.' Here we are presented with a concise and popularly worded narrative of that distinguished Italian naturalist's long and successful travels (for a short time in company with his friend Giacomo Doria) in that great and only as yet partially explored island, during the years succeeding 1865. The scientific results of his explorations, which have these many years placed the author in the first rank of the scientific men of Europe, and distinguished him as a field naturalist of the best type, have been described from time to time in his own special periodical 'Malesia,' and in other well-known scientific journals by himself or others. The present volume is Dr. Beccari's journal annotated with the fuller knowledge gained by the elaboration of his vast collections; it is practically a summing up of his long investigations. And as one would expect from a geographer and a field naturalist of his wide interests in and knowledge of nature endowed with the keenest powers of observation, we have a volume full of solid information charmingly conveyed, which we trust may ere long be translated into our own language for the benefit of a larger number of readers than those to whom it can appeal in its Italian dress. The appendices, by no means the least valuable portion of the book, deal with a general view of the virgin forests of Borneo, with the production of camphor, gutta-percha, indiarubber, and other vegetable oils; gums, resins, aromatics and dyes, and also with the fruits and fibres which the island produces, finishing with the scientific descriptions of a large number of new Malayan and Papuan figs of the family of the *Artocarpeæ* collected by himself. The book contains an excellent index, and is full of illustrations.

H. O. F.

TORRES STRAITS AND BORNEO.*

It will be within the recollection of many of the readers of the *Geographical Journal* that Prof. Haddon proceeded to Torres Straits in 1898, at the head of an expedition for the investigation of the anthropology of that region. Liberally endowed by the University of Cambridge, and assisted by the Royal Geographical Society and the British Association, the leader was able to secure a staff of colleagues, each of whom was specially qualified to undertake a particular line of research—some to devote themselves to the language and traditions of the people, others to their physical structure, and mental and sensory capabilities. The expedition was therefore equipped as no other, from England at all events, has ever been, for investigating a native race in all points which come under the designation of anthropology. The volume now under review, written by the leader of the expedition, and entitled 'Head Hunters, Black, White, and Brown,' is a general narrative of the journeyings of these white head hunters, and of some of the sights they witnessed and facts they gleaned—preliminary to a complete and detailed account which will follow in due course, which, it is not difficult to predict, will be worthy of their opportunities and their combined talents. The expedition, after completing its work in Torres Straits, in part crossed over to the New Guinea mainland, and finished by a visit to Sarawak in Borneo. The results of their studies among the Torres Straits islanders, to whom their mission was in particular directed, will be published by the Cambridge University Press as a series of special memoirs; while the observations collected in New Guinea and Borneo will appear in various scientific journals as opportunity offers. The first section of the volume deals with Torres Straits, and starts with the Murray islands. Work was begun by the establishment of a dispensary, where advice and medicine were gratuitously given by the medical members of the expedition, whose patients were deftly allured as subjects into the adjoining psychological and metrical laboratories, where, through their complacency and conscientiousness in performing the tests set them, a large number of valuable records were obtained. The expedition gave special attention to the investigation of the initiation mysteries for the formal reception of the lads into the community of men, which, in the Murray islands, is known as the *Malu* ceremonies; and of the *zogos* or divination shrines and sites of powerful charms. In Murray island true totemism does not now seem to exist, but there is an important brotherhood, and into it the *Malu* ceremonies gave admission. Through his well-known sympathetic fellowship with all humans, and his genial camaraderie, our author possesses a wonderful power of eliciting the confidence and reaching the inner workings of the minds of native races, a qualification which it is impossible to overrate in one charged with the sort of investigations he had set out to make. With infinite pains Prof. Haddon succeeded in recovering, when all but too late, from the fading memories of the few remaining old men—for the young men know nothing of them—the main facts of these forgotten ceremonials and old-time fashions of a primitive stage of their culture. The *Malu* ceremonies took place, sometimes at all events, at the *zogos* or shrines hidden away in secluded spots in the bush, which consist of collections of stones specially arranged and named, upon which divination is accomplished by the voices and movements of birds, lizards, insects, or the appearance of natural objects in relation to the stones. Dr. Haddon succeeded in having the long-neglected sites, with their stones, shells, and monumental figures, cleared of the vegetation in which they had become quite buried, and by various artifices inducing the old men—after overcoming their natural reticence in divulging before strangers these solemn rites—to go through the ancient ritual and ceremonial of their creed, with the sacred objects, paraphernalia, and costumes (remodelled for the occasion to the best of their recollection), so that as complete an account as is perhaps now possible has been photographed and placed on record. The full details of these mysteries will be awaited with impatience by all interested in the evolution of brotherhoods, totem-clans, and religious observances. In the islands of Kiwai, Mawatta, and Saibai, in Mabuiag, lying in mid-strait, and in some half-dozen other western islands subsequently visited, a totemistic stage of culture was found existing, which provided the expedition with the opportunity of making important contributions to this very polemical subject, towards the elucidation of which a great deal in late years has been contributed, with much deep insight, by Dr. Frazer and Prof. Baldwin Spencer, whose theory that totemism is an economic custom receives some corroboration from the facts collected by this expedition in the island of Mabuiag especially.

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* 'Head Hunters, Black, White, and Brown.' By Alfred C. Haddon, SC.D., F.R.S. Methuen.

The second part of this book gives a chatty narrative of the trip undertaken by Dr. Haddon and his colleagues Ray, Seligmann, and Wilkin along the Papuan coast, with their by-excursions into the interior to as far south as Hood peninsula. The ground here was already harvested considerably by himself and previous observers, so that fewer lines of inquiry were left virgin for them; still, they give us, among other subjects, detailed descriptions and some illustrations of the figures of many of the dances of the tribes they visited, and of the games and toys of their children, which are additions to our knowledge.

A large third section of the 'Head Hunters' is devoted to a description of the experiences of the members of the expedition who visited Borneo at the invitation of Dr. Hose, the Resident of Baram in the Sarawak Government, under the sanction and with the interest and help of its ruler (Sir Charles Brooke). Dr. Hose, who has resided long in the country, possesses an unrivalled acquaintance with its languages and ethnography. His happy association with Haddon and his colleagues could not be but of the highest value and importance to the investigation of the numerous ethnographical problems that require solution in Borneo. Hose and Haddon, as ethnologists congratulate themselves to learn, purpose to deal conjointly with this interesting subject at some length in a memoir elsewhere. Dealing with it on broad lines, our author believes that the whole of Sarawak was inhabited in the earliest times by a weak agricultural people, now represented by a number of tribes who may for the present be regarded as indigenes, and for whom he and Dr. Hose propose the collective name of *Kalamantan*—a mixture of narrow-headed Indonesians and broad-headed Proto-Malays, with an infusion of early immigrant Philippine and "Indo-Javan" blood (or, as we should prefer to say, "Indo-Malayan," for the Javanese are really a Hindu+Malay, if not a Hindu +Malay+Indonesian complex). The nomad forest-dwelling Ukits and Punans are a further indigenous race, whose description reminds us very strongly of the Kubus of Sumatra. Among these is found a foreign element, first of all in the Kenyahs and Kayans—a comparatively recent immigration, whose good physique and firm social organization have given them an advantage over the original natives of the soil; next in the Sea Dyaks (for whom Haddon proposes the definite scientific term *Iban*), who probably belong to the same stock as the original Malay, whose "immigration may be regarded as the first wave of the movement that culminated in the Malay empire;" and lastly, in the Malay or piratical element, who, themselves keen for slaves and booty, allured probably the Iban to join them "for the sake of glory" and the reward of the heads of the slain, for the accumulation of which they have long shown such a special passion—the Iban being the head-hunters of Borneo *par excellence*. This combination of Iban and Malay it is which is generally but inaccurately spoken of as the Sea Dyaks. It is an interesting fact, as Haddon notes, that the decorative art of the Iban men "is entirely distinct in motive and style" from that of their women. May not this suggest an exo-Iban influence to which the men have given way, while the women's patterns belong to the old-time fashion of their people? Prof. Haddon, personally conducted by Hose, was enabled to witness the ceremonies attending many of the remarkable superstitions in various districts of Sarawak, the details of which he has succeeded in recording and sketching. "The Omen Animals of Sarawak" and "The Cult of Skulls" occupy two chapters full of original observations. The cult of omens the author believes to be indigenous to Borneo, but unconnected with totemism, and head-hunting he thinks is a comparatively recent institution—in Hose's opinion not over two hundred years old. Space forbids us to refer to many other tempting topics.

Altogether, this volume, which is illustrated by many excellent process-blocks from photographs taken chiefly by Mr. Wilkin, who, to the great regret of ethnologists, has not survived to see the fruits of his labours, is full of interest, and whets our appetite for the special memoirs promised us in due course.

H. O. F.

THE GEOGRAPHY AND GEOLOGY OF CELEBES.*

This volume is the fourth of the great monograph by the brothers Sarasin, on the natural history of Celebes, one of the most beautiful, and, from the point of view of its geographical configuration, one of the most remarkable islands of the Indian Archipelago, as it is one of the most important, in regard to its position and biological history, in the region. The first two volumes were a necessary preliminary to an understanding of the third, and now a study of all the three must be a preliminary to the complete comprehension of the present beautifully printed and sumptuously illustrated book, which deals with the geography and geology of the island, to the real history of which it is a notable contribution. An orographical map, which is a very fine specimen of cartographical skill, supplies all that is needed, as well as makes it easy and pleasant, to follow the descriptions given in the text. It was the authors' intention to have provided a geological chart of the island as well, but their attempt had regretfully to be abandoned, for they found, as the work progressed, that the results would be in many places entirely hypothetical, because the regions of the island from which as yet not a single rock is known are still numerous. The geology of Celebes must, therefore, be followed from the text alone.

The authors describe in special detail the northern arm of the island, in which lies the most interesting and admittedly the most beautiful region of the Minahassa with its numerous volcanoes, devoting, indeed, more than half of the book to it. Then in succession are described the several peninsulas, which, like the spokes of a revolving svastika, this extraordinarily shaped island throws out. A study of the map gives us, almost for the first time, a clear idea of the surface features of the island, and reveals many geographical characteristics which have hitherto been unrecognized. Celebes is seen to be ploughed into a series of parallel ranges, lying in a nearly north-and-south direction, which in the neighbourhood of the equator have been deflected at an abrupt angle towards the east. Between these parallel ranges lie more or less extensive plateaux, or wide valleys, traceable the whole length of the island from the northern to the southern sea, uninterrupted by few if any cross-spurs. In these valleys are situated a series of remarkable lakes, fed by rivers flowing in a north or south direction, whose waters reach the sea on the east or west coasts through breaks in the chains. The great gulfs of Tomini and Tomaiki are seen to occupy depressions within the converging arms of the easterly curving ranges, and in the very acute angle of the latter is to be noted a fracture of the more easterly ridge, allowing an inroad of the sea; also, along the abrupt outer or western curve of the main parallel ranges which traverse the length of the island, the westernmost suddenly breaks off (as if it had disrupted in the bending), and gives place to a much denudated coast, bounding a low foreshore till where the hills turn eastward it reappears and continues as the northern, east-to-west-trending ridge of the island. Across the elbow of the right angle—over which the equator passes—occurs the narrowest portion of Celebes, and the only place where there exists no high land, so that one can travel from sea to sea without encountering more than gentle undulations of the surface. The shorter eastern chains traversing central Celebes from north to south appear to be only stumps of what they once were. One is also struck, on a study of the map, by the fact that no volcanic cones exist along the mountain chains, several of whose summits reach over 5000 feet, except at the extreme ends of the two longer ranges of the western side, where their arms diverge in the Minahassa and the Macassar regions. The Minahassa cone-cluster extends from the Klumbangan river eastwards to the land's end, and culminates in the Klabat, 6600 feet in height; while at the southern extreme of the double range the peak of Bantaeng, "a stupendous volcanic block, in size and extent not inferior to Etna," covered with parasitic cones, dominates the landscape as the voyager approaches Macassar, being seen, as is the Klabat, from a great distance at sea. No serious eruptions are recorded from these centres in very recent times, except from Una-Una, a small sea-encircled crater in the Gulf of Tomini, which in the violent outburst of 1898, lasting several months, discharged enormous quantities of ashes, which covered the ground to a depth of several millimetres as far off as Donggala, several hundred miles distant on the west coast.

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* 'Materialen zur Naturgeschichte der Insel Celebes. Band iv.—Entwurf einer Geographisch-Geologischen Beschreibung der Insel Celebes.' Von Dr. Paul Sarasin und Dr. Fritz Sarasin.

The remarkable lakes we have referred to above lie, as has been said, in the hollows between the parallel ranges. The larger and more interesting are those situated between the two long western chains, which, but for the solution of continuity in the more westerly one, along its elbow, would form a continuous trough from Macassar to the Minahassa, namely, Lakes Limbotto, Lindu, and Tempe; and in the wider but shorter depression, stretching from the Gulf of Tomini to that of Bone, lie the Posso, Mantana, and Towuti "seas." These lochs seem to occupy old sea-bottoms now dammed off from the ocean once inundating the synclinal troughs, or lie in deep clefts there along lines of fault parallel to the ranges. In the former cases subsequent sinking of their floors has prevented them from becoming filled up by the alluvium brought down by the rivers. Several of these lakes are of great depth, Posso being nearly 1000 feet and Motana over 1500 feet. The mollusca collected from them by the Sarasins and described in their first volume are of particular interest in presenting a Tertiary facies, some of the *Melaniidæ*, indeed, having very close affinities with those of the European

Miocene. In this respect they resemble such "Grabenversenkungen" as Tanganyika and other lakes in the Rift-valley of Africa.

The geological formations represented in Celebes, so far as brought to light by the investigations of the Sarasins and others—for our authors have most carefully collated all the recorded observations of the various travellers and investigators in the island, with due credit to each—appear to be, beginning with the lowest, sandstones and crystalline schists, over which lies a massive deposit of Red Clay (probably assignable to the Cretaceous), whose included *Radiolaria* indicate its deposition in a deep sea. The authors note as remarkable that they found no certain traces of the Jurassic formation, which is well displayed in the neighbouring Sula islands, but it is its occurrence there which has induced them to speak hypothetically of the granular crystalline limestone found in the central ranges of Celebes, as perhaps dynamically metamorphosed Jurassic limestone—a fragment of the Chino-Australian Jurassic continent of Neumayer, of which the islands of the Malayan archipelago are the disrupted fragments. Over the Red Clay and beneath the Eocene nummulite limestone occur coralline beds, whose presence points to a continental condition of Celebes, which the Sarasins think may have endured to the beginning of the Tertiary period. The deep pre-Eocene sea which filled the region which the island now occupies, gradually shallowed and became filled with nummulitic and coralline limestones. Upon these repose beds of sandstone and conglomerate (a formation to which the authors give the name of *Celebes Taveyannaz*), and also those which they designate as 'Molasse,' containing marine, brackish, fresh water and land remains, all of Miocene age. The elevation which began at the close of the Eocene resulted, during the Miocene, in the upheaving of the mountain systems we now see in the island, and as a consequence in the outbreak of volcanic action, the outflow of lavas and ashes, and the formation of intrusive dykes. The latter are most carefully described in an appendix to this volume by Dr. Schmidt. This elevation continued during the Pliocene, when the area of Celebes attained its maximum, which was again reduced during the Pleistocene by subsidences.

The remarkable configuration of Celebes has attracted the attention of all who have visited it or studied the geography of the region, and its great similarity to Halmaheira has not escaped observation. The Sarasins, discrediting the idea that the form of these islands can be accidental or a mere sport of nature, suggest a mechanical explanation, similar to that proposed by Suess for the Alpin-Appenine system of Europe, for the peculiar trend of the mountain chains of these two islands, namely, two antagonistic vortices sliding beneath each other, the inner *against* and the outer in the *direction* of the hands of a watch.

Altogether this extremely able, interesting and suggestive volume, is a contribution of the highest value to the history of this part of the Indian Archipelago. We note with regret, however, that, like so many German works, it is not provided with an index, which, in a volume which must always be a work of reference, is a great and serious shortcoming.

H. O. F.

POLAR.

VOYAGE OF THE "BELGICA." *

In his eloquent preface M. Reclus pays a tribute to the modesty and self-effacement of M. de Gerlache in his expedition, the preparations for which, it would appear, has occupied his thoughts and formed the aim of his endeavours for many years.

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* 'Voyage de la *Belgica*.' Quinze Mois dans l'Antarctique par le Commandant de Gerlache. Préface par Elisée Reclus. Paris: Hachette & Cie. 1902.

The book itself commences with a short summary of previous expeditions from the time of Dirk Gerrtsz, and an account of the efforts made to organize the *Belgica* expedition and raise the necessary funds. The narrative of the voyage occupies the rest of the volume, and this gives in a popular form an excellent account of the events and incidents of the first expedition wintering in the antarctic regions. Perhaps it makes too little of the discomforts and hardships, but that after all is a venial fault. The book is written in excellent taste and spirit, and the author succeeds in making his narrative popular without being flippant, and serious without being dull.

The illustrations are not altogether trustworthy "documents," for a good many of them are photographs which have been improved upon by the artist, and some, especially the portraits, are only "after photographs," and leave a great deal to be desired.

The facts regarding the memorable cruise of the *Belgica* are so well known to our readers that it is unnecessary to repeat them. It is satisfactory to have at last what may be looked upon as the authoritative account of the cruise; but, of course, the great monument of the expedition will be the magnificent series of memoirs now being published at Brussels, dealing comprehensively with all the collections and observations.

THE MONTHLY RECORD.

THE SOCIETY.

Honour for the President.—The following communication has been received by our President, Sir Clements Markham, from the President of the Peruvian Commission of Fluvial Highways; it is dated, Lima, July 15, 1902:—

"The Committee over which I preside, in the fulfilment of the high charge with which it has been entrusted by the Supreme Government, has believed it to be a duty to give a testimony of cordial esteem and sympathy to you, by conferring the name of *Port Markham* on the place where steam navigation commences on the river Tambopata, which has now been reached for the first time by a Peruvian Commission, and where a station has been established. Your name is thus connected with one of the richest zones of Peru, which has merited so much interest from studies by which we set a high value.

"At the same time I have pleasure in announcing to you that the station formed at the mouth of the same river Tambopata, where it unites with the Madre de Dios, has been named *Port Maldonado*, as a tribute to the memory of the late Colonel Don Faustino Maldonado, who, as you are aware, was the modern discoverer of the great river Amarumayu."

EUROPE.

Distribution of Fog in Switzerland.—The results of a detailed study of the conditions attaching to the prevalence of fog in Switzerland, somewhat on the lines adopted for Germany by Hugo Meyer and for Great Britain by R. H. Scott, have been put forward by Gottfried Streun in a dissertation for the degree of doctor in the University of Berne. The author discusses in much detail the distribution of fog in Switzerland, both in time and space, as well as the relations between the general condition of the weather and the occurrence of fog. Some of the broader generalizations only can here be referred to. In the region of valley-fog the morning is the time when the phenomenon is most marked, owing to the nightly cooling of the ground and the superincumbent atmosphere; while in the case of mountain-fog, the frequency of occurrence is distributed pretty evenly through the hours of the day. In the lowlands, again, a clearly marked yearly period is to be traced, while with an increase of altitude this becomes less and less recognizable. The maxima and minima fall at somewhat different times of year in different parts of Switzerland, though at the lower levels the maximum occurs with more or less regularity towards the close of the year (most frequently in November). Already at about 1000 metres the yearly period loses its well-marked character, both valley and mountain fog here occurring side by side. In the higher valleys the maximum occurs in October, and the minimum in winter, while on mountain summits two very slight maxima can be traced in May and October. Dr. Streun gives maps showing the distribution of fog in space, both for the year as a whole and for the summer and winter half-years, as well as a series showing in detail the distribution at short intervals during the autumn of 1897. In the region below 1000 metres, with which alone the maps deal, the greatest frequency of fog occurs in the central lowland, a zone with over fifty days of fog in the year running along the foot of the first chain of the Jura, with a width of about 15 to 20 miles. On the other hand, fogs are least frequent in the deep Alpine valleys, both in the north and south, which show generally less than twenty days of fog in the year. This is in part due to the influence of the Föhn. Other points touched upon are the average duration of individual periods of fog at different stations and at different seasons, and the average altitude of the upper limit of fog, with its variations at different hours of the day.

The Tectonic Relations of Crete.—We have already referred (*Journal*, vol. xix. p. 212) to the scientific expedition undertaken by MM. Ardaillon and Cayeux for the study of the physical geography and geology of Crete. The researches of the French savants are of special interest from the small amount of definite knowledge previously possessed as to the structural lines of the island, and from the fact that, according to the tectonic theories of Suess, Crete would lie on the course of the great Dinaro-Tauric arc of that geologist. Suess supposed that, as in parts of Greece, the structural lines of the island ran from west to east, and that it thus formed with Cyprus a connecting link between the Dinaric chain and the Taurus. In the *Comptes Rendus* of the Paris Academy of Sciences (vol. 134, No. 20), M. Cayeux points out the extent to which the researches of himself and M. Ardaillon tend to modify the conceptions of Suess. In Western Crete, the part of the island examined by them last year, no trace of an east-to-west direction was discovered, the peculiar promontories running from south to north in this section being, in their view, the northern terminations of anticlinals of which the western versant has invariably collapsed, giving the headlands their characteristic asymmetry. This state of things does not, apparently, extend very far to the east, but even if the Dinaric system can really be traced in this direction, it is maintained that an important branch must certainly run in an almost opposite direction, through the extreme west of Crete. This would seem in any case to be connected with the African continent, though whether it there maintains a south-westerly direction, or whether it continues to curve until it finally assumes an east-to-west direction, must be left to future investigation to decide.

The Topography of the Vienna Forest and Basin.—The latest addition to the series of classical monographs known as 'Penck's Geographische Abhandlungen' is a volume on the recorded variations of topography in the Vienna forest and basin, by Dr. Alfred Grund. The precise limits of the area dealt with are: west, the Traisen; north, the Danube; east, the political frontier; south, the Schwarza, the Semmering, and again the frontier to the Salza. Accepting the fact that changes of surface-form due to purely natural causes, and variations of climate, may be taken as of negligible amount within historic times, Dr. Grund begins with two descriptive chapters—one on the structure and surface of the district, and another on the climate. These are models of what such chapters should be; they aim at setting forth the facts of physical geography so as to describe the conditions presented by the region for cultivation and settlement, leaving questions of development and cause to the geologist and meteorologist. Next follow the main sections of the work on the topography and the changes in the topographic picture during the middle ages. These occupy more than one-third of the whole book, and the two together form an exhaustive investigation, by historical methods, into the relation between the physical conditions of the district and its population in the earlier stages of colonization, the main object being to separate out conditions due to the original environment from conditions induced by colonization itself. The discussion is chiefly based on analysis of the forms of settlements—isolated units (*Scotticé*, "touns"), hamlets, villages, etc.—and of the structure of dwellings, the well-known work of the Austrian anthropologists being utilized. A number of types is recognized in each case; these are correlated with each other, and the distribution brought into line with the historical and ethnographic boundaries. It is impossible to give here a detailed account of Dr. Grund's laborious investigation, a splendid example of the power of modern geographical methods when employed with proper attention to detail in matters of fact. Suffice it to state some of the general conclusions. (1) The form and position of settlements (*Ortschaften*) are the fundamental and constant factors, their size and number the most important variables. (2) Where the physical conditions are unequal, the position, size, number, and form of the settlements are determined by these physical conditions and by the race of the settlers conjointly, the former deciding specially the positions and the latter the forms, while the influence of both in determining size and number is about equal. (3) Where the antecedent physical conditions are the same, differences in position, size, number, and form of settlements are to be accounted for by historical causes, or by differences in the place of origin of the race of the settlers. Such regions are valuable in affording an opportunity of estimating the effects of the action of these influences by themselves. (4) The size of individual settlements varies inversely as their number and directly as the populousness of the region. Small villages have a relatively large number of settlements, but small population; hence large settlements widely distributed indicate a relatively large population. But it is to be observed that the law holds good only in agricultural districts, and not in industrial regions or on lines of communication. In these latter the populousness is independent of the number of settlements, but varies directly as their size. (5) The structure of dwellings and settlements is a joint product of the community and of the surroundings. The prevailing ethnographic element in the population determines the type of dwelling, except in so far as types belonging to an earlier colonization are retained. In general, the type becomes modified by the superposition of new forms upon the old. (6) For the reason just stated, the types of dwellings can only be employed in identifying ethnographic units to a very limited extent, and the greatest caution must be exercised. (7) The number, size, and populousness of agricultural settlements is subject to regular oscillations following a definite law. (8) These oscillations depend on the variation in productiveness of the region, the curves ascending to a maximum and descending to a minimum at times of greatest and least productive value in the land. (9) Periods of great productiveness are periods of artificial topography (*künstlicher Landschaftsbilder*) in which man, intentionally or unintentionally, veils the face of Nature. During minimum periods, on the other hand, Nature reasserts herself, and favourable or unfavourable conditions of soil and climate become of greater relative importance. (10) The fluctuations of industries are in the opposite direction; minimum productiveness means a maximum of industry involving hired labour, and the size and populousness of settlements increases, although their number remains the same.

ASIA.

Overland Journey from the Persian Gulf to Maskat.—Major Percy Cox, H.B.M. Consul at Maskat, writes to inform us of a successful journey made by him in May last from Abu Thabi, on the pirate coast of the Persian gulf, overland to Maskat through the interior of Oman. He hopes to send later some notes on the journey for publication in the *Journal*, and meanwhile gives only a brief indication of the route followed. From Abu Thabi, which was reached on board a gunboat, he struck east for Bereimi (shown on Mr. Zwemer's map in the *Journal* for January last), meeting on May 14 Rashed, Wali of Semail, a man of much influence with the tribes, who had been sent overland by the Sultan to meet him. The route seems to have then turned south-east across the Dahera, passing through Dhank (perhaps the Danj of Zwemer), Ibri (evidently the Obri of Wellsted, the terminus of that traveller on his way inland from the east coast) to Gabrin and Bahla, also visited by Wellsted early in the nineteenth century. Hence Major Cox struck east or north-east to Nezwa and Tanuf, on the southern side of the Jebel Akhdar, or Green mountain (cf. Colonel Miles's paper in the *Journal* for November, 1901). This range belies its name, being, like the rest of the country, absolutely desert, apart from a few well-watered spots. After some difficulty the permission of the Beni Riyan to cross the mountains was obtained, and Major Cox visited the elevated villages of Saik and Sheraizi (see Colonel Miles's map), where the temperature was found to be unpleasantly cold after the burning climate of the plains. Descending on the northern side of the range to Meti, the traveller continued his route to Maskat *viâ* Semail, reaching the former place on May 29.

The Navigation of the Tigris.—The navigation of the Tigris, the chief means of communication which Baghdad has with the outer world, is stated to be growing increasingly difficult. This is partly owing to neglect of dredging operations, and partly to the unchecked habit adopted by local agriculturists of cutting irrigation channels and primitive canals in various unscientific ways, and thus causing the river to silt up or widen out into broad shallows at difficult places. The insufficiency of the steamer traffic, in the opinion of Major Newmarch, our Acting Consul-General, is also largely responsible for the unpromising condition of affairs. He points out that with due attention to these points the trade of Baghdad and the neighbouring districts would be considerably increased, and the country developed to an extent which would amply repay the expenditure incurred.

The Orenburg-Tashkent Railway.—The railway from Orenburg to Tashkent, though projected two years ago, has only recently had its exact direction determined. It will run from Orenburg southward to Tletski Zashita, and thence in a south-easterly direction past the northern shore of the Aral sea to Kazalinsk on the Syr Daria. Continuing along the valley of that river through the towns of Perovsk, Julek, and Turkestan, it thence bends somewhat to the east and passes through Chemkent to its terminus at Tashkent. The whole distance to be traversed is 1160 miles, and the line is mainly strategic in character. The cost of construction is estimated at £13,000,000, and the work is to be completed ready for traffic by January 1, 1905.

AFRICA.

Scientific Expedition to Algeria and Tunis in 1731.—Dr. Martin Grosse, of Leipzig, has recently called attention, in the *Mitteilungen* of the Geographical Society of that city, to an expedition sent out to Algeria and Tunis in the early part of the eighteenth century, which has hitherto been somewhat overlooked by students of the historical geography of Africa. Its promoter was Augustus the Strong, Elector of Saxony, who in 1731 despatched the German *savant*, Johann Ernst Hebenstreit, with five European companions, to North Africa, for the special object of scientific research. To it, therefore, in Dr. Grosse's opinion, belongs the distinction, assigned by Vivien de St. Martin to Niebuhr's expedition sent out thirty years later by the King of Denmark, of being regarded as the pioneer enterprise in the field of scientific exploration. In spite of the important part played by North Africa in the early history of the Mediterranean, the Barbary States were, at the opening of the eighteenth century, virtually unknown to Europeans apart from their coast-line, with which the nations of Europe had been brought into contact by the long-continued struggle with the Corsairs. Four names stand out among those of lesser travellers of the period, to whom were due the first steps towards an improved knowledge—the Englishman Thomas Shaw, the Spaniard Francisco Ximenes, the French *savant* Peyssonnel, and the German Hebenstreit; and amongst these the last-named, and his companion Christian Gottlieb Ludwig, occupy a somewhat special place as members of an expedition organized on a large scale, instead of travelling alone and on their own account. Hebenstreit's letters were published in part in 1783, while extracts from the remainder (which dealt with the more important part of the journey) were first made public in 1865. An instructive narrative, written by Ludwig, has only lately been discovered, and entitles its author to rank with the other four investigators alluded to. Dr. Grosse gives biographical sketches of both Hebenstreit and Ludwig, and describes their journeys in considerable detail, as far as possible in the words of the explorers themselves. He also gives a map, in which he lays down their various routes, so far as they can be traced with certainty or probability.

Surveys in South Africa.—The recently issued report of the astronomer at the Cape for 1901 records the extension of the geodetic arc of the meridian to the Zambezi during the year. Many difficulties were experienced in the prosecution of the work, and the short observing season, which lasts only from March to July, came to an end before the programme had been entirely completed, with the result that two or three stations south of the Zambezi still require to be occupied with the geodetic theodolite. In the interval between the observing seasons of 1900 and 1901, the wires used for measuring the base near Salisbury were re-compared at the Royal Observatory, the measurement of the angles from the Salisbury (Gwibe) base to the main triangulation was completed, and signals were exchanged for the longitude of Salisbury. The operations northward from the Zambezi will be organized from Chinde as a base. The survey of the Anglo-German boundary in South-West Africa has made steady progress, both by triangulation in the field and by the reduction of previous observation, while the beaconing of the boundary south of Reitfontein has been commenced. A more accurate determination of the 20th meridian than had been previously made was effected, the result being to place the point taken by Bosman to represent that meridian in 19° 59′ 58·94″, a difference of only 1″·06. The whole of the field operations have been rendered difficult by the flat and arid character of some parts of the country, and the wood and bush met with in other parts.

AMERICA.

The Physical Geography of the Red River Valley.—A paper on this subject by D. B. Dowling, B.SC., which first appeared in the *Ottawa Naturalist*, vol. xv. No. 5, has been reprinted as a pamphlet, illustrated by two maps. Mr. Dowling points out that the Red River valley, the hills bounding it on the west, and the rugged plain on the east, are three distinct regions, which primarily owe their special characteristics to the various geological formations of which they consist. A study of these deposits has convinced Mr. Dowling that at any rate part of Manitoba had been twice submerged beneath the sea, and finally elevated before the glacial period. The ice then gradually travelled southwards, till it completely filled the Red River valley and even extended over Minnesota. As the ice melted, a large lake was formed along its southern margin, which increased in extent as the ice retreated northwards, and beaches were formed along its shores. The lake was at first drained southwards to the Mississippi, but later "the water found other outlets, probably towards Hudson bay, and a gradual contraction of the lake ensued, in which successive beaches mark the different stages." These beaches are indicated on the map of part of Manitoba which accompanies the paper. The present lakes of Manitoba are the remains of this great lake of former times, through whose waters the boulder clay and other sediment falling in large quantities into it must have been constantly sifted and distributed over the district, thus causing the wonderful fertility which characterizes most of the Red River valley.

The Klamath Mountain System in the Western United States.—The name Klamath mountains has been given of late years to a number of ranges in the Western United States which have been thought deserving to be distinguished from the Sierra Nevada and from other coast-ranges. Geologically, they are known to resemble the Sierra Nevada in the age and character of their formations, but they are separated from that range by the broad structural valley of the Sacramento, the upper course of which, with the Rogue river, bounds the group on the east. The Klamath mountains have hitherto been regarded as forming a *complex* without any definite order, but in a recent paper in the *Journal of Geology* (vol. x. No. 2) Mr. F. M. Anderson endeavours to show that a certain general system exists in their arrangement that has hitherto escaped notice. In his opinion they may be classed into two main systems, which he believes to have a definite relation to the dynamical history of the region. These two systems cross each other nearly at right angles, the most conspicuous ranges, including the Rogue river, Siskiyou, Scott, and Trinity mountains, running westerly or south of westerly, while many of the less important ridges follow a northerly or north-westerly direction. Some of the east and west ranges may be traced right across the Cascade range, and they evidently represent axes of structural development that are very old as compared with others in the same region. Although their east and west course has had a controlling influence on the greater drainage, it is possible also to recognize the effect of the north and south lines of folding on the structure of the country as seen in the trend of the ranges and the courses of streams. The principal north and south fold coincides with the Salmon river range and its continuation north and south. It crosses all the principal rivers in a way which demonstrates its comparatively recent age, the streams having developed deep and narrow cañons through it during the course of its gradual elevation. The resulting type of valley is characteristic of the region. Mr. Anderson describes what he considers to be the general course of the geologic history of the Klamath mountains, in which he finds evident traces of an elevated peneplain at an altitude of 4000 or 5000 feet. It is to be referred to degradation during the Cretaceous and Tertiary periods, but has been subjected to disturbances, giving rise to the features above alluded to. The question of the existence of remnants of an old peneplain in the Klamath region is also discussed by Mr. O. H. Hershey in a preliminary note in *Science* for June 13, fuller treatment being reserved for a paper to be published elsewhere. This peneplain is localized by the writer in the Trinity basin, in the neighbourhood of the Sierra Cos'a mountains, at an altitude of about 3800 feet, and it is regarded as the equivalent of the late Tertiary peneplain of the Sierra Nevada region.

Portland as a Trade Centre.—The development of Portland, Maine, has of late, judging from our consul's report, been remarkable. With 40 feet depth of water at low tide, vessels of any tonnage can lie in the harbour. The port is served by six great steamship lines—the Dominion, Allan, Elder-Dempster, Hamburg-American, Thomson, and Leyland Companies—and the city, being the terminus of a like number of railways, taps a vast extent of country. The products of Canada, British Columbia, and Manitoba are brought hither by the Grand Trunk, and much grain and cattle from the Western States. Some thousands of cars are needed to cope with this Western and Canadian traffic, and it is stated that at times the Grand Trunk yards in Portland have cars enough standing to make a continuous train 15 miles in length. Two enormous elevators, the largest on the Atlantic coast, one with the capacity of 1½ and the other 1¼ million bushels, deal with the grain, and it is said that during last winter these were taxed to the utmost. Attention is drawn to the great advantage that reciprocity with Canada would be to both parties concerned, and the Portland Board of Trade has now taken up the question with the hope of bringing this important measure to a successful issue in the near future.

Glacial Work in the Western Mountains.—The *Journal of Geology* contains a short account of studies of Pleistocene problems in the western mountains of North America, carried on by the U.S. Geological Survey during 1901. Four small parties, under the general direction of the writer of the notice, Mr. Rollin D. Salisbury, were in the field; and of these, three devoted themselves to detailed study of selected areas, with the view of ascertaining the general conditions of glaciation at a number of widely separated points. It is expected that "when a sufficient number of selected areas have been studied similarly, the results will afford a basis for preliminary conclusions concerning the course of Pleistocene history in the western mountains, and will be helpful in guiding future work." Mr. Salisbury spent about six weeks in the region; one party was in north-western Montana, east of the Rockies; one farther west, on the western side of the Rockies, in north-western Montana, northern Idaho, and eastern Washington; one in the Wasatch mountains; and one in the mountains of New Mexico, a few miles north-east of Santa Fé.

The Boston Mountains.—A paper by Mr. A. H. Purdue, on the physiography of the Boston mountains, Arkansas, read at the Denver meeting of the American Association for the Advancement of Science, is published in No. 8 of the current volume of the *Journal of Geology*. The northern division of the Arkansas highlands, with its western extension into Indian territory, constitutes the southern part of the Ozark region. It is divided in Arkansas into a low and a high part, the former extending northward into Missouri, and passing along its southern border, into the latter, which forms the Boston mountain region, and consists of an irregular but bold escarpment from 500 to 1000 feet high. The whole division is structurally distinct from the southern highlands or Ouachita mountains, from which it is separated by the valley of the Arkansas river: it is a region of horizontally bedded rocks, somewhat disturbed by faulting and folding, while the Ouachita is essentially a folded region. To the north of the Boston mountains lies a low region of great denudation. From its north-eastern part all the rocks have been removed above the Ordovician, leaving those exposed at the surface. West and south of this is a region from which the Upper Carboniferous rocks have been removed, leaving those of Lower Carboniferous age at the surface. Standing up prominently on the latter are numerous hills of circumdenudation, composed of remnants of the horizontal strata of the Boston mountains. The height of these outliers very closely approximates to that of the plateau of which they were formerly a part. This uniformity of height suggests a peneplain, the determination of which forms the problem of the region, and offers some special difficulties, because while the denudation of the extensive region to the north has been very great and the topography is old, that of the Boston mountains is limited, and the topography is young. Mr. Purdue accounts for the difference in the stages of erosion by supposing the Boston mountain area to have been at a lower elevation than the area to the north at the time the extensive denudation was in progress on the latter, and that elevation to a height of about 2500 feet took place in the late Tertiary or in post-Tertiary time.

AUSTRALASIA AND PACIFIC ISLANDS.

Exploration in the Kimberley District of Western Australia.—Survey work of some importance was carried out last year by an expedition to the little-known interior of north-west Kimberley, under the leadership of Mr. F. S. Brockman, whose report has now been printed at Perth as an official paper. Among the members of the party were included Mr. C. Crossland as second in command, Mr. A. Gibb Maitland, the Government geologist, and Dr. F. M. House, as naturalist and botanist, and observations were made by them on the various aspects of the country traversed from a scientific point of view. The starting point was Wyndham, at the head of the western arm of Cambridge gulf, whence the western branch of the Pentecost river, named the Chamberlain by Mr. Brockman, was traced upward to about 17° S. It was found to flow in a narrow valley between high sandstone ranges and plateaux, the western wall being impracticable for horses for a long distance. A possible route was, however, discovered on this side, and the tableland crossed in a westerly direction towards the region north of the Leopold range, traversed by various streams flowing into inlets on the west coast of the Kimberley district. As far as the Charnley river it was a poor and rugged sandstone country, seamed by deep gorges, and uninhabited, but more promising districts, generally basaltic in formation, were afterwards discovered. The courses of various streams were determined, and the survey connected with points on the coast fixed on by admiralty surveys. Some difficulty was experienced in identifying positions laid down by the late Sir George Grey, in the region of the Glenelg river, but it was at last discovered that, probably owing to a clerical error, the features in this neighbourhood were put down by that observer about 10′ south of their true position. The country further north was afterwards explored, and a considerable river, named the King Edward, discovered. It flows generally northward, and empties itself into Napier Broome bay. The return journey hence to Wyndham was made by the parallel valley of the Drysdale, which was also explored independently by Mr. Crossland. The whole region is estimated to contain three-fourths of sandstone to one-fourth basaltic country, the latter attaining its greatest elevation (about 2500 feet) in about 16° S., 125°-126° E., in which locality the basalt appears to have originated. This country has a soil of reddish loam, splendidly grassed throughout. The sandstone area consists generally of tablelands covered with light sandy soil, poorly grassed except near the higher basalt country, and seamed with deep and rugged gorges. The extent of valuable pastoral country north of the Leopold range is estimated by Mr. Brockman at between 7,000,000 and 8,000,000 acres, most of it eminently suited for sheep, and all of it for cattle and horses. Apart from its grazing capabilities no product of commercial value was discovered. The pastoral country is not everywhere accessible to the coast by reason of the rugged sandstone ranges by which this is lined, but it is considered that Walcott inlet might be utilized as a means of access to the southern portion, while the whole of the country north of 16° can best be served by the establishment of a port on Napier Broome bay or Vansittart bay, the former possessing an especial advantage in its good water-supply. The climate may be considered a good one, although the region is well within the tropics. The natives, who were generally met with in small hunting-parties, and are evidently nomadic in their habits, seem to belong to two distinct types, those to the south of 15° being tall and light of limb, while those further north were of a shorter and more robust type. All had axes and chisels of iron, principally cart-tire iron or shovel blades, which seem to have reached them by inter-tribal barter across from the goldfields. Large numbers of rock paintings were seen in the western part of the district, and are specially dealt with in the report. Kangaroos of many varieties are especially numerous on the basalt lands, and the many rivers and creeks abound in fish, but water-fowl are surprisingly rare, possibly owing to the large number of crocodiles—the small harmless variety—found in the pools.

Biology of the Chatham Islands.—In a paper recently read before the Manchester Literary and Philosophical Society, Prof. Arthur Dendy treated of the Chatham islands, mainly with reference to their biology. The fauna and flora of the group are shown to be isolated detachments of those of New Zealand, with which latter place these islands appear to have at one time been connected. There are, however, many striking differences in species and varieties, which imply a long period of isolation. It is pointed out as probable that during the Upper Pliocene period the area of New Zealand was greatly extended, so as to embrace, for example, Chatham island in the east, Lord Howe island in the north-west, Auckland and Campbell islands in the south, which area has been styled by Diels "Great New Zealand." This condition is supposed to have lasted on into Pleistocene times, and to have been followed by another depression, which left the islands very much in their present condition. The author brings forward three reasons to account for the existing differences between the fauna and flora of the Chatham islands and those of New Zealand. He points out that—(1) The climate of the Chatham islands is only suitable for certain portions of the New Zealand flora. (2) In the days of "Great New Zealand" an enormous desert tract must have existed between the Chathams and New Zealand proper, which doubtless formed a serious barrier to the migration both of plants and animals. A number of temperate types, however, appear to have reached the Chathams along the coast from the south. The vegetation of the Chatham islands is largely of a coastal type, and the absence of many of the characteristic elements of the New Zealand flora, as possibly also of the Moas and Riwis, may be due to conditions of climate. (3) Sufficient time has elapsed since the islands again became disconnected from the mainland to permit of the origin of many new species or varieties. The author points out that the importance of isolation in the development of new species could hardly be better illustrated than in the fauna and flora of the Chatham islands.

The Marianne Islands.—An interesting account of a recent visit to the northern islands of the Marianne group, by a German Government official, Herr Fritz, appears in the *Mitteilungen a. d. Deutschen Schutzgebieten* (1902, No. 2), accompanied by a series of sketches which give an excellent idea of the physical character of the several islands. The northern portion of the group (north of 16°) differs from the southern in the almost entire absence of coral formation, which in the six southern islands covers the volcanic core to the very summit of the peaks. The northern islands are formed of purely volcanic rocks, coral rock being rare even on the coasts. On certain of them the volcanic cones are still active, while the remains of old craters, now extinct, are plainly visible on others. Medinilla, the first of the islands described by Herr Fritz, belongs to the southern group, and the sketch given of it shows its totally different character. It is a coral rock rising steeply from the sea to a height of 100 feet, the top being a nearly level plateau, covered with low bush, grass, and lilies. Of the purely volcanic islands, the smaller consist of single or double cones, while the largest of all, Pagan, contains an irregular group of peaks in the south (including one active volcano) and an isolated volcano in the north, the two portions of the island being united by a belt of lowland. Assongsong (which the Spaniards corrupted into Asumcion, but which is really a Khamorro name, and means "belonging to the Songsong," a family still residing on Rota) is an almost perfect cone, broken at the summit by a small crater, and is the highest of the Mariannes (3120 feet). It abounds in extraordinarily large land-crabs, which have brought about the diffusion of the coconut palm over the whole island. Perhaps the most remarkable of the group is Maug ("hole"), formerly known also as Tunas ("steep"), and incorrectly named Uracas on the chart, this being the old name for the Farallon de Pájaros, the northernmost island of the group. Maug is composed of three rocky islands, the remnants of an old crater, which enclose a deep and spacious harbour. According to Ibañez, the destruction of the old crater was subsequent to the first arrival of the Spanish missionaries, but a passage in Le Gobien's 'Histoire des Isles Marianes' (1699) shows that this is incorrect. The islands fall steeply to the harbour, and their ridges are crowned with pillar-like projections of rock, which are the continuations of perpendicular veins of hard basalt. It was possibly on this account that the name "Las Monjas" was given to Maug by the Spaniards. The only industry at present practised on the islands is the collection of copra. The three islands Alamágan, Págan, and Agrigan are leased for the yearly sum of 8000 marks, in addition to which payment the lessees (a Japanese and two natives) have undertaken important services for the Government. Herr Fritz thinks that in the future more may be done to develop the islands, which possess advantages in their good harbours. In old times the group was much more peopled than at present, but Herr Fritz searched in vain on several of the islands for remains of ancient settlements.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Term "Indian Summer."—An elaborate dissertation on the origin and use of the term "Indian summer" is contributed to recent numbers of the

Monthly Weather Review (1902, Nos. 1 and 2), by Mr. Albert Matthews, who, from a careful study of English and American literature, arrives at the conclusion "that the term 'Indian summer' first made its appearance in the last decade of the eighteenth century; that during the next decade the expression 'second summer' was used, indicating that there was no generally accepted designation for the supposed spell of peculiar weather in autumn; that this spell itself was first noticed shortly before 1800; that the term 'Indian summer' became established about twenty years after its earliest appearance; that it was first employed in Western Pennsylvania; that it spread to New England by 1798, to New York by 1809, to Canada by 1821, and to England by 1830; that the term is not merely an Americanism, but has become part of the English language in its widest sense. . . . In short, to write in praise of the 'Indian summer' is now a literary convention on three continents." On coming, however, to the second part of the study, the endeavour to account for the origin of the term, the writer finds it more difficult to arrive at any definite conclusion. The explanations given, both of the precise meaning of the term and of the reason for its use, have been extraordinarily various, and none of them is altogether convincing. The numerous extracts given by Mr. Matthews show that writers differ as to the special characteristics of "Indian summer" (though haziness is considered its attribute by a majority of them), as well as to the part of the United States in which it is mainly experienced. Of the many suggested explanations of the origin of the term perhaps the most noteworthy are—(1) That such a spell of warm weather was predicted by Indians; (2) that the smokiness of the atmosphere at the time in question was due to the burning of the prairies by the Indians; (3) that the Indian summer was used by the Indians for their last attacks on the settlements before the setting in of winter; (4) that it partook of the Indian character of deceptiveness; (5) that the name was applied by some traveller who had been in India, and who noticed the resemblance of the weather to that of the plains of India in the dry season. This last would seem the most plausible, though Mr. Matthews doubts whether many visitors to the United States towards the close of the eighteenth century had previously been in India. It is somewhat remarkable that the term was used by Horace Walpole so early as 1778, but it is conclusively shown that this had no reference to America, but was merely used to denote heat such as is characteristic of the tropics. Mr. Matthews quotes the expression "Squaw winter" as applied to the preceding spell of cold weather, and it seems possible that if this could be explained, some light might be thrown on the parallel term.

Botanical Geography and its Practical Application.—Mr. Hardy, in a paper in the *Scottish Geographical Magazine*, lays stress on the practical value of a study of botanical geography, with a view to obtaining from the soil the largest yield compatible with the preservation of its resources. The two physiographic conditions on which vegetation depends are those of climate and soil. During the course of ages, the combined influence of these has brought about such special characterization and grouping of plants, as to enable maps to be constructed showing the distribution of various "plant associations." A plant association will consist not only of plants possessing homologous methods of adaption to their physical environment, but of others which find their most favourable or exclusive stations in conditions determined by these homologous plants. Since climate is the chief factor which determines the great phytogeographical regions, the geographer Köppen has found it possible to indicate these on a map of the principal climates; but in the determination of the smaller regions it is the soil that plays the most important *rôle*. Botanical cartography has made great progress in recent years, as, *e.g.*, in the maps of Prof. Flahault for France, and the late Mr. Robert Smith for parts of Scotland. Such botanical surveys are badly required for agriculture development, and Mr. Hardy dwells at length on the special need of forest surveys and on the desirability of reforesting certain districts, more particularly the highlands of Scotland. The evils resulting from excessive deforestation are manifest in the Mediterranean region, on the Alps and Pyrenees, and in parts of Russia; while historic evidence is not wanting to prove that valuable forests once extended over large areas in Scotland, now only covered with heather, peat-bogs, and marshes. Timber is in increasing demand, and unless steps are shortly taken to create fresh supplies, there seems reason to fear that the supply will cease to meet the need, and the world may be suffering from a timber famine in another fifty years. Even the great forests of Canada and Sweden are rapidly disappearing in the face of disastrous forest fires and the wood-pulp industry. Mr. Hardy points out that the Scandinavian countries, which have always been noted for their great and vigorous forests, in geological structure closely resemble the highlands, while the latter region has the advantage of a milder temperature. From this he argues that physical conditions would favour the reforestation of large tracts of North Britain, an undertaking which without doubt would indirectly contribute to the salubrity and habitability of the country, and furnish, in time, a profitable employment for a large proportion of the population.

GENERAL.

Vacation Course at Oxford.—In connection with the School of Geography, a special course of lectures and practical work, both in and out of doors, was held between July 29 and August 21. It was specially designed for teachers, and the gratifying number of thirty, half of whom were women, took advantage of it. Of the students, two were university and college lecturers, five were lecturers in training colleges, and the others were masters and mistresses in public high and preparatory schools. With two exceptions, the men were university graduates. One student hailed from America, two from Wales, five from Scotland, and the others from the south of England. Mr. Mackinder delivered the opening lecture on the Scope and Methods of Geography. Mr. Dickson discussed Recent Advances in Geophysics and Climatology, especially modern theories of the figure of the Earth, atmospheric circulation, ocean currents and tides, and conducted the field class, which learned how to map with plane-table, prismatic compass, and clinometer. Mr. Darbishire held a class for Map-drawing. Mr. Herbertson lectured on Typical Land Forms and Their Distribution, and, with the assistance of Miss Croom-Brown, gave demonstrations of relevant large-scale maps, and lessons on the reading and interpretation of them. Mr. Beazley lectured on the History of Exploration, especially in more modern times. Economic geography was discussed by Mr. Beazley, whose subject was Land Trade Routes, Present and Past; and by Mr. Herbertson, who dealt, by request, with the Economic Zones and their Influence on Maritime Trade. The library of the school was much used, and Miss Croom-Brown acted as librarian. The course ended with two whole-day excursions, in both of which Mr. Mackinder took part. One was to the Windings of the Eventode, conducted by Mr. Herbertson, and the other to the Upper Coln and the Thames-Severn Divide, conducted by Mr. Dickson.

OBITUARY.

Dr. Johann Jankó.

We have to record the death of the ethnographer, Dr. Johann Jankó, which took place on July 28 at Borszék, a small watering-place in the eastern Carpathians, in the thirty-fourth year of his age. Jankó was widely known through the researches he carried out and published for Count Eugen Zichy. Born at Budapest on March 13, 1868, he studied at the university there, and graduated in 1890. He travelled in Egypt in 1888, in Tripoli and Tunis in 1889, and in 1890 and 1891 was sent to study the ethnographical institutions of France and England. During 1892 he acted as assistant in the Geographical Institute of the university of Budapest under Ludwig von Lóczy, and during 1894 as assistant curator in the ethnographical department of the Hungarian National Museum. In 1898 he made his arduous journey on behalf of Count Zichy through the marshy forests of the middle Ob and its tributaries, the region of the Ostiaks of western Siberia (see *Geographical Journal*, September, 1900, p. 347). On his return in 1900 with vast quantities of material, which were not fully worked out at the time of his death, he was appointed Director of the Ethnographic Department of the Museum. Amongst his publications may be mentioned, 'Das Delta des Nils,' 1890; 'Das ungarische Volk von Kalota,' 1892; 'Das ungarische Volk von Torda, Aranyosszék und Torszko,' 1893; 'Die Herkunft der magyarischen Fischerei,' 1900; 'Anthropologische Studien über die Ostiaken,' part still unpublished. As a member of the Commission for investigating Lake Balaton, he worked at an 'Ethnographie der Umwohner des Plattensees,' in connection with which he made large numbers of measurements in a laboratory equipped under his direction. A first series of 'Magyarischen Typen' appeared in 1900. Dr. Jankó was secretary of the Hungarian Geographical Society for a year, and latterly editor of the Zeitschrift of the Ethnographical Society.

Dr. Alexander Bittner.

Dr. Alexander Bittner, geologist-in-chief in the Geological Survey Office in Vienna, died suddenly of heart failure on March 31. Born in Friedland, in Bohemia, on March 16, 1850, he attended the Gymnasium of Ticin and Prague, and in 1869 went to the University of Vienna, beginning his official connection with the Geological Survey in 1871. His geological field-work, however, dates from 1874, when he distinguished himself in the survey of the classical grounds of eastern central Greece, and later he took part in the Austro-Hungarian survey of south-eastern Bosnia and Herzegovina. Then followed surveys in south-west Tirol, southern Styria, and the northern limestone Alps. Most of his papers appear in the publications of the Academy of Sciences and of the Geological Institute of Vienna. Bittner was also a collaborator in Hofrath Becher's 'Hernstein in Niederoesterreich,' published by commission of the Archduke Leopold; and it was his work in connection with this which first led him to take up the investigation of the limestone Alps. He also took part in the scientific exploration of the Platten See. Bittner was not only a noted palæontologist, and as such an authority on the Alpine Trias, but as a stratigraphical geologist he gave much attention to geomorphology. His knowledge of the limestone Alps between Vienna and Salzburg was unique.

CORRESPONDENCE.

Waltzemüller's Globe of 1507.

Mr. Chisholm (*Geographical Journal*, vol. xix., p. 389) is quite right when he assumes the word *solidum* in the title of Waltzemüller's 'Cosmographiæ Introductio' to refer to a globe. The lunes of a small globe, corresponding in every respect to the description there given, are now in the collection of Prince Liechtenstein. These lunes were first recognized by Varnhagen as being the work of Waltzemüller (*J. Schoener e P. Apianus*, Vienna, 1872), whilst the learned French geographer, L. Gallois (*Les Géographes allemands de la Renaissance*, Paris, 1890), who publishes a facsimile of them, holds the same opinion, and advances solid arguments in favour of the date 1507 being assigned to it. Prof. Wieser's preliminary notes on the large map of the world recently discovered at Castle Wolfegg (see Mr. B. S. Soulsby's article, *Geographical Journal*, xix. p. 201) go far to confirm these hypotheses, for, apart from differences of scale and the resultant fuller nomenclature, the map and the globe seem to be absolutely identical. Nor can there be a doubt that the map, of which an edition of one thousand copies was printed, was freely made use of by Glareanus (1510), Joannes de Stobnicza (1512), Boulenger (1519), Peter Apianus (1520), and Schöner (1515 and 1520). It has been suggested that Schöner (or Waltzemüller) copied Behaim's globe of 1492. This, however, could refer only to Eastern Asia, and especially the chain of islands stretching from Madagascar and Zanzibar to Candym and Cipangu, for only in this quarter of the world do the two delineations agree. I cannot for a moment admit this suggestion. Both Behaim and Waltzemüller had evidently access to maps of an earlier date, maps which were likewise drawn upon by the engraver of the Laon globe. On this globe there certainly is a legend, below the *Mons Niger*, the furthest point reached by Cão in 1483, that "thus far did the Portuguese ships advance up to 1493," but a glance at its outline should satisfy the most sceptical that this document is of a date much more ancient than that to be inferred from this legend. Its author knew nothing even of the discoveries made by direction of Prince Henry the Navigator, and still less of those made subsequently by Cão and Diaz. I believe, in fact, that the names *S. Thomas* and *Mons Niger*, as well as the legend above referred to, were added years after the globe had been completed, just as some of our modern map publishers have added a recent date to an old and obsolete map, in the hope of thus giving it a new lease of life.

I avail myself of this opportunity to point out that Dr. L. Henkel's map of the Mediterranean, showing the visibility of land, is not the first map of that description (*Geographical Journal*, xix. p. 502), but has been preceded by a similar map designed by me in illustration of the voyages of Cão and Diaz, which was published in your *Journal* for December, 1900, or more than a year before Dr. Henkel's map appeared in the *Mitteilungen*.

E. G. Ravenstein.

The Shwe-li and Tai-ping.

The following is an excerpt from a letter from Mr. H. Hayter Duff to myself on this subject (see *Geographical Journal* for July, 1902).

R. L. Jack.

Sima, North-East Frontier, Upper Burma, July 24, 1902.

With reference to the Shwe-li and Tai-ping, I would wish to add the following remarks and corrections to my first letter to you.

The Shwe-li or Lung Kiang rises north-east of the Tai-ping, and very probably not more than 5 to 10 miles north. Above the Tali-fu-Yung-chang-Teng-yueh road it is hemmed into a very narrow valley, and has no tributaries to speak of. The area it drains south of the above point increases considerably, and as it joins the Irawadi below Katha, and just about opposite to Tig-yaing, the Tai-pi-no (so often erroneously called the Tai-ping), on the contrary, is joined by quite considerable streams within the first 20 miles or so of the river, and drains quite a considerable area compared to the Shwe-li in its (the Shwe-li's) upper reaches; hence the difference in quantity of water noted by you. Another point, too, is that the rainfall decreases towards the east of the Irawadi watershed and the outlying spur which separates the Shwe-li basin from the Salwen, and, indeed, the whole country east of Tai-ping, owing to long-continued deforestation and general barrenness of the soil, for many a long year had a much smaller yearly rainfall than that which falls in the Irawadi basin. This, too, would conduce to the less volume of water carried down by the Shwe-li in its upper reaches. As, however, it flows into the Irawadi basin proper, and receives the drainage of the part of the lower hills of the north Shan States round south of Bhamo, its volume increases rapidly in the rains—sends down an enormous volume of water into the Irawadi (I have seen the Shwe-li in flood).

This information of mine is, I am quite sure, perfectly correct.

North again of the Shwe-li are one or two fairly big streams, which join the Salwen north of parallel 26° or so. (The sources of the Tai-ping and Shwe-li are between 25° 38′ and 25° 50′ approximately.) The Salwen at that parallel takes a big bend in towards the west, and its distance from the Irawadi at about parallel 26° 45′ or 27° I estimate cannot be more than 60 miles as the crow flies. It is very probable that it was at that near approach of these two great rivers that the Chinese mountain tribes came first into contact with the hill tribes of the Irawadi basin, producing the hybrid tribes of Lashis and Azis.

The subject to me is one of intense interest, and, having sojourned up here so many years, I have, of course, had opportunities of theorizing and proving my theories, *and* the reverse.

H. HAYTER DUFF.

Earthquakes in Kashgar.

45, Hornsey Rise Gardens, London, N.,
September 18, 1902.

I TRANSMIT to you the following information regarding earthquakes in Kashgar, which I have just received, by a letter dated the 23rd of August last, from my substitute Captain P. J. Miles, British Agent at Kashgar:—

"We have just had a terrible earthquake here. Mr. Petrovski says he has not had a similar experience in these parts. The seismic waves seemed to move from north to south.

"As regards this house, the porch was shaken down, but otherwise no very serious damage was done. The Russian Consulate too has suffered a little.

"A good deal of mischief has been done in the town, yamêns, &c., and there have been some deaths owing to fallings of walls.

"Mr. Petrovski is informing the Russian Geographical Society; and he has kindly given me the following data as to the times of the different shocks:—

"*22nd August.*—8 a.m., severe shocks, 1½ min.; 8.35–9.15, shocks were felt; 915, shocks stronger; 10, two shocks; 12 noon, one shock; 1 p.m., one shock;

2.30, one shock; 3, one shock; and up to 5 p.m. tremblings were felt. The first shock at 8 a.m. caused the main part of the damage.

"Again, last night, between 7.30 p.m. and 9.30 p.m. there were some pretty severe tremblings, and there may have been others during the night. Even as I write now at 8 a.m., there has been a shock."

George Macartney.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Is. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

France—Cevennes. *B.S. Languedoc. G.* **24** (1901): 405-444. **Viala.**
La Sérane et ses Mines d'Or. Par M. F. Fernand Viala.

France—Hérault. **Sahuc.**
B.S. Languedoc. G. **24** (1901): 67-94, 232-261, 333-348, 488-500.
Sources historiques et bibliographie de l'arrondissement actuel et de l'ancien diocèse de Saint-Pons-de-Thomières. Par J. Sahuc.

France—Languedoc. **Calvet.**
B.S. Languedoc. G. **24** (1901): 213-231, 316-332, 467-487; **25** (1902): 43-68.
La Montagne noire. Par J. Calvet. *With Map and Illustrations.*

France—Meteorology. *Ann. G.* **11** (1902): 203-220. **Blanchard.**
La pluviosité de la plaine du Nord de la France. Par Raoul Blanchard. *With Maps and Diagrams.*

Germany—Botany. **Schulz.**
Aug. Schulz: Ueber die Entwicklungsgeschichte der gegenwärtigen phanerogamen Flora und Pflanzendecke Mitteldeutschlands. (Sonderabdruck aus den Berichten der Deutschen Botanischen Gesellschaft, Jahrgang 1902, Band xx. Heft 2.) Berlin, 1902. Size 9½ × 6½, pp. 54-81. *Presented by the Author.*

Germany—Nordstrand. *Globus* **82** (1902): 31-32. **Hansen.**
Die Insel Nordstrand um 1600. Von R. Hansen.

Based on accounts of the island and its inhabitants written by Pastor Johannes Petersen in the sixteenth century.

Germany—Rhine and Westphalia. **Lampe.**
Vierteljahrs. G. Unterricht 1 (1902): 251-263.
Ein Studienausflug von Berliner Oberlehrern in das rheinisch-westfälische Industriegebiet. Von Dr. Felix Lampe.

Germany—Weser & Sons. **Keller.**
Weser und Ems: ihre Stromgebiete und ihre wichtigsten Nebenflusse. Eine hydrographische, wasserwirthschaftliche und wasserrechtliche Darstellung. Auf Grund des Allerhochsten Erlasses vom 28 Februar 1892 im Auftrage des preussischen Wasser-Ausschusses herausgegeben von H. Keller. 5 vols. and Atlas (Vol. v. Tables.) Berlin: Dietrich Reimer (Ernst Vohsen), 1901. Size (vols. i.-iv.) 11½ × 7½; (vol. v.) 13½ × 10; (atlas) 21 × 18. Pp. (vol. i.) xviii., 336, and 168; (vol. ii.) 604; (vol. iii.) 700; (vol. iv.) 576; (vol. v.) 246. *Price*, Text 48*m.*; Atlas 56*m.* *Presented by the Publisher.*

This important work will be specially reviewed. It is the fourth of the series, of which the first appeared in 1896, and completes the detailed description of the hydrography of the principal German river-systems.

Germany—Württemburg. *Deutsch. Rundschau G.* **24** (1902): 444-455. **Kammerer.**
Der Hohe Neuffen. Von J. Kammerer. *With Illustrations.*

Greece. *Petermanns M.* **48** (1902): 106-110. **Philippson.**
Nachträge zur Kenntnis der griechischen Inselwelt. Von Prof. Dr. Alfred Philippson. *With Map.*

Hungary—Kremnitz. —
Deutsche Rundschau G. **24** (1902): 165-171, 219-222, 259-264, 310-317.
Kremnitz in Oberungarn. *With Illustrations.*

Italy—Apulia. *Petermanns M.* **48** (1902): 115-119. **Fischer.**
Eine siedlungskundliche Studie über Apulien. Von Prof. Dr. Th. Fischer.

Italy—Chioggia. **Pinotti.**
A travers le Monde, Tour du Monde **8** (1902): 217-219, 225-228.
Une Venise pauvre: "Chioggia et les Baruffe Chiozzotte" de Goldoni. Par F. Pinotti. *With Illustrations.*

Italy—Historical. *B.S.G. Italiana* **3** (1902): 493-523. **Rosetti.**
Montefeltro. Note di geografia storica del Emilio Rosetti. *With Illustrations.*

Italy—Sardinia. *Riv. G. Italiana* **9** (1902): 380-382. **Lovisato.**
Le cime più elevate del Gennargentu. Del D. Lovisato.
See note in the Monthly Record for June (p. 751).

Macedonia. *Abh. K.K.G. Ges. Wien* **4** (1902): 1-170. **Oestreich.**
Beiträge zur Geomorphologie Makedoniens. Von Dr. Karl Oestreich. *With Maps.*

Montenegro. *Blackwood's Mag.* **171** (1902): 733-744. —
Montenegrin Sketches.

Rhine. *Globus* **82** (1902): 21-28. **Walter.**
Die Stromschnelle von Laufenburg. Von Dr. Heinrich Walter. *With Illustrations.*
Cf. note in the *Journal* for August (p. 225).

Rumania. *Deutsch Rundschau G.* **24** (1902): 419-421. —
Die Petroleumproduction in Rumänien. *With Map.*

Rumania—Geographical Dictionary. **Lahovari. Brătianu, and Tocilescu.**
Societatea Geografică Romînă. Marele Dicţionar Geografic al Romîniei alcătuit şi prelucrat dupa dicţionarele parţiale pe judeţe de George Joan Lahovari, şi General O. J. Brătianu, Grigore G. Tocilescu. Volume iv. Bucuresti: J. V. Socecŭ, 1901. Size 12½ × 9½, pp. 792. *Presented by the Societatea Geografică Romînă.*

Russia. *Vierteljahrs. G. Unterricht* 1 (1902): 229-230. **Immanuel.**
Canalverbindung zwischen dem Kaspischen und Asow'schen Meere. Von Hauptmann Immanuel.

Russia. **Lodijensky and others.**
Glasgow International Exhibition, 1901. Russia, its Industries and Trade. Issued by order of State Secretary S. J. De Witte Imperial Russian Minister of

Finance. Glasgow: Hay, Nisbet & Co., 1901. Size 9½ × 7½, pp. xii. and 324. *Map. Price* 4*s.* 6*d.*

A useful summary of the economic conditions of Russia, by various authors.

Russia—Finland. *Fennia* 10 (1894–1901): No. 2, 1–242. ——

Katalog öfver trigonometriska och astronomiska punkter i södra Finland intill 61sta breddgraden bestämda åren 1860–1886 af Ryska Generalstabens Topografiska Afdelning. *With Map.*

ASIA.

Chinese Empire—Nan-shan. *Petermanns M.* 48 (1902): 97–106. **Diener.**

Die wichtigsten geographischen und geologischen Ergebnisse der Reisen W. Obrutschews im zentralen und westlichen Nan-schan. Von Prof. Dr. C. Diener. *With Map.*

Dutch East Indies—Bibliography. **Nijhoff.**

A list of the best books relating to Dutch East India, made up in commemoration of the Third Centenary of the Foundation of the East India Company (March 20, 1602), and offered at the affixed prices by Martinus Nijhoff, Bookseller. The Hague, 1902. Size 19 × 6½, pp. 40. *Map (on cover).*

The map is a reproduction of that accompanying Houtman's voyage.

Dutch East Indies—Gold. **Carthaus.**

Tijds. K. Ned. Aard. Genoots. Amsterdam 19 (1902): 581–586.

Ueber Goldlagerstätten in Niederländisch Indien, nebst Beobachtungen über den Aufbau des Gebirges im Flussgebiete des oberen Gadis (Sumatra), briefliche Mittheilung von Dr. E. Carthaus.

India. *J.R. Statistical S.* 65 (1902): 209–283. **Atkinson.**

A Statistical Review of the Income and Wealth of British India. By Fred. J. Atkinson.

India—Assam. ——

Agricultural Department, Assam. Bulletin No. 8. (Revised Edition of Bulletin No. 2, Agricultural Series.) Agricultural Series 4. List of the Cultivated Plants of Assam. Revised. Size 13 × 8, pp. 26 and iv. *Price* 2*d.*

Indian Ocean—Aldabra. **Voeltzkow.**

Ueber Coccolithen und Rhabdolithen nebst Bemerkungen über den Aufbau und die Entstehung der Aldabra-Inseln. Von A. Voeltzkow. Die von Aldabra bis jetzt bekannte Flora und Fauna. By the same. (Sonderabdruck aus den Abhandlungen der Senckenbergischen naturforschenden Gesellschaft. Band xxvi. Heft iv.) Frankfurt a. M., 1901. Size 11½ × 9, pp. 467–538, 541–566. *Presented by the Author.*

These papers will be specially noticed.

Japan—Bonin Islands. **Yoshiwara.**

Geological Magazine, N.S., Decade iv. vol. ix. (1902): 296–303.

Geological Age of the Ogasawara Group (Bonin Islands), as indicated by the occurrence of Nummulites. *With Maps.*

Japan—Formosa. **Campbell.**

Formosa under the Japanese: being notes of a visit to the Taichu Prefecture. By Rev. W. Campbell. Helensburgh, 1902. Size 9½ × 6, pp. 30.

Japan—Formosa. **Kenny.**

Trade of South Formosa for the years 1900 and 1901. Foreign Office, Annual No. 2796, May, 1902. Size 9½ × 6, pp. 28. *Price* 2*d.*

Malay Archipelago—Borneo. *B.G.S. Philadelphia* 3 (1901): 51–64. **Hiller.**

Manners and Customs of the People of Southern Borneo. By H. M. Hiller. *With Illustrations.*

Malay Archipelago—Celebes. **Marle.**

Tijds. K. Ned. Aard. Genoots. Amsterdam 18 (1901): 932–953; 19 (1902): 108–148, 373–403, 535–552.

Beschrijving van het Rijk Gowa (Celebes). Door V. J. van Marle. *With Map and Profiles.*

Manchuria. **Samson-Himmelstjerna.**

Kolon. Z. 3 (1902): 124–126, 141–142, 159–161, 176–179, 198–200, 218–219.

Gelbrussland. Von H. v. Samson-Himmelstjerna.

Persian Gulf. *Imp. and Asiatic Quarterly Rev.* 13 (1902): 225-234. **Lynch.**
The Persian Gulf. By H. F. B. Lynch.

Philippine Islands—Magnetism. **Doyle.**
Magnetical Dip and Declination in the Philippine Islands. Brief Notice of the Same. By Rev. John Doyle. Manila, 1901. Size 8½ × 6¼, pp. 10. *Diagrams.*

Russia—Caucasus. **Stevens.**
Trade of Batoum and District for the year 1901. Foreign Office, Annual No. 2782, 1902. Size 9½ × 6, pp. 28. *Price* 2*d.*

Russia—Siberia. *Asien* 1 (1902): 122-127, 133-138. **Krafft.**
Reiseerinnerungen aus Sibirien und dem Uralgebiet. Von Hauptmann Krafft. *With Map.*

AFRICA.

Congo. *Ann. Hydrographie* 30 (1902): 360-361. ——
Wahrnehmungen von Stromgeschwindigkeiten und -richtungen vor der Congo-Mündung am 15 April, 1902. *With Diagram.*

Egypt. *Petermanns M.* 48 (1902): 110-112. **Kumm.**
Die südliche Karawanenroute von der oase Charga nach Dachla (Darb-Er-Rubari). Von H. K. W. Kumm. *With Map.*

Egypt. **Willcocks.**
Egypt Fifty Years hence. An Address delivered at a Meeting of the Khedivial Geographical Society, with H. E. Abbate Pasha, President of the Society, in the Chair. Cairo, March 15, 1902. By Mr. W. Willcocks. Cairo, 1902. Size 9½ × 6, pp. 36.

A forecast of the economic development of the Nile valley, as the result, in particular, of extended irrigation, during the next fifty years. The writer advocates the settlement of Fellahin in the upper part of the valley.

Egypt—Irrigation. *Z. Ges. Erdk. Berlin* (1902): 305-322, 390-410. **Lampe.**
Die Bewässerung Ägyptens. Von Dr. Felix Lampe.

Egypt—Orthography. ——
Rules of Orthography for Native Names of Places, Persons, etc., in Egypt and the Sudan (with Index). Second Edition. Cairo, 1901. Size 9½ × 6½, pp. 26. *Presented by the Intelligence Office, War Office, Cairo.*

The spellings are based on the R.G.S. system, slightly modified to suit the special requirements of the case. The forms Suakin, Addis Abbaba, Mohammed, Khartoum, are adopted. In the case of the last-named it is to be regretted that the old form is retained, as Khartum has now been widely adopted, while the corresponding form Sudan is accepted.

Egypt—Sinai. **Hume.**
The Rift-Valleys and Geology of Eastern Sinai. By W. F. Hume, D.SC. Read before the International Geological Congress, Paris, August, 1900. London: Dulau & Co., 1901. Size 8½ × 5½, pp. 50. *Presented by the Author.*

Fernando Po and Spanish Guinea. *B.R.S.G. Madrid* 43 (1901): 273-309. **Vilches.**
Fernando Póo y la Guinea española. Por el commandante Don Eladio López Vilches.

German East Africa. **Dundas.**
Trade of German East Africa for the year 1901. Foreign Office, Annual No. 2819, 1902. Size 9½ × 5, pp. 24. *Price* 1½*d.*

German East Africa. *Deutsch. Kolonialblatt* 13 (1902): 257-259. **Neuhaus.**
Aus dem Bezirk Pangani.

Kamerun. *Globus* 81 (1902): 333-337, 350-354, 369-372. **Conradt.**
Die Ngúmba in Südkamerun. Auf Grund längeren Aufenthaltes unter ihnen dargestellt von L. Conradt. *With Map.*

Kamerun. *Deutsch. Kolonialblatt* 13 (1902): 90-92, 162-163, 238-239. **Pavel.**
Expedition des Oberstleutnants Pavel.

The expedition made its way (*viâ* Bali) to Banyo, one of the southern sultanates of Adamawa.

Kamerun—Cartography. *Z. Ges. Erdk. Berlin* (1902): 428-433. **Singer.**
Zur Kartographie von Kamerun. Von H. Singer.

Madagascar. *Rev. Madagascar* 4 (1902): 289-314. **Baldauf.**
Journal de Route du Bas Manambovo à Tuléar. Par Sergent Baldauf. *With Illustrations.*

NORTH AMERICA.

America. *Deutsch. Rundschau G.* **24** (1902): 433-444. **Jüttner.**
Fortschritte der geographischen Forschungen und Reisen im Jahre 1901. 1. Amerika. Von Dr. J. M. Jüttner.

Canada—Bibliography. **Wrong and Langton.**
Review of Historical Publications relating to Canada. Edited by Prof. George M. Wrong and H. H. Langton. Vol. vi. Publications of the year 1901. The University of Toronto. Published by the Librarian, 1902. Size 11 × 7, pp. xiv. and 226.

Canada—New Brunswick. **Ganong.**
A Monograph of the Evolution of the Boundaries of the Province of New Brunswick. (Contributions to the History of New Brunswick, No. 5.) By William F. Ganong, M.A., PH.D. (From the *Transactions of the Royal Society of Canada*, Second Series, 1901-1902. Vol. vii. Section ii. English History, Literature, Archæology, etc.) Ottawa: J. Hope & Sons, 1901. Size 10 × 6½, pp. 139-450. *Maps. Presented by the Author.*

This will be specially noticed.

Canada—Red River Settlement. **Hunt.**
Britain's One Utopia. By Frank L. Hunt. (Historical and Scientific Society of Manitoba, Transaction No. 61.) Winnipeg, 1902. Size 9 × 5½, pp. 16. *Presented by the Historical and Scientific Society of Manitoba.*

Canada—Rocky Mountains. ———
A Famous Mountaineer in the Canadian Rockies. Issued by the Passenger Department, Canadian-Pacific Railway Co., 1902. Size 7½ × 5, pp. 24. *Illustrations. Presented by the C. P. Ry. Co.*

On Mr. Whymper's recent work in the Rocky mountains.

Canada—Rocky Mountains. *National G. Mag.* 13 (1902): 151-168, 185-200. **Wilcox.**
Recent Exploration in the Canadian Rockies. By Walter D. Wilcox. *With Map and Illustrations.*

Labrador. *B.G.S. Philadelphia* 3 (1902): 65-212. **Delabarre.**
Report of the Brown-Harvard Expedition to Nachvak, Labrador, in the year 1900. By E. B. Delabarre, PH.D. *With Maps and Illustrations.*

North America—Earthquakes. *Z. Ges. Erdk. Berlin* (1902): 367-389. **Deckert.**
Die Erdbebenherde und Schüttergebiete von Nord-Amerika in ihren Beziehungen zu den morphologischen Verhältnissen. Von Dr. Emil Deckert. *Maps.*

United States—Arizona. *Sierra Club B.* 4 (1902): 77-87. **Brewer.**
Into the Heart of Cataract Cañon, Grand Cañon of Arizona. By Rev. William A. Brewer. *With Map and Plates.*

United States—Boundaries. ———
Report of a Conference upon the Boundaries of the Successive Acquisitions of Territory by the United States, November, 1899, to January, 1900. (Twelfth Census of the United States. Census Bulletin, No. 74, July 20, 1901.) Washington. Size 11½ × 9, pp. 4. *Map.*

United States—California. *American J. Science* 14 (1902): 33-37. **Hershey.**
Significance of Certain Cretaceous Outliers in the Klamath Region, California. By O. H. Hershey.

United States—California. *Sierra Club B.* 4 (1902): 88-99. **Le Conte.**
My Trip to King's River Cañon. (Reprint.) By Dr. Joseph Le Conte. *With Plate.*

United States—California. *Science* 15 (1902): 670-672. **Smith.**
The Submarine Valleys of the California Coast. By W. S. Tangier Smith.

See note in the Monthly Record for July (*ante*, p. 104).

United States—Historical. *Rev. G.* **50** (1902): 127–140, 201–217. **Viallate.**
Le développement territorial des États-Unis. Par Achille Viallate. *With Map.*

United States—Iowa—Loess. *J. Geology* **10** (1902): 245–251. **Udden.**
Loess with Horizontal Shearing Planes. By J. A. Udden. *Map and Illustration.*

United States—Minneapolis. *J. of G.* **1** (1902): 249–262. **Hall.**
Minneapolis and its Environs. By C. W. Hall. *Maps and Illustrations.*

United States—Minnesota. *J. of G.* **1** (1902): 241–249. **Hall.**
Minnesota. A Sketch. By C. W. Hall. *Map and Illustrations.*

United States—Pacific Slope. **Lemmon.**
Sierra Club B. **2** (1897–98): 61–78, 156–173; **4** (1902): 100–131.
Conifers of the Pacific Slope: How to distinguish them. By John G. Lemmon. *With Illustrations.*

United States—Population. *Rev. G.* **51** (1902): 1–22. **Levasseur.**
La population des Etats-Unis. Par E. Levasseur. *With Map.*

CENTRAL AND SOUTH AMERICA.

Argentine Republic. *Ann. G.* **11** (1902): 247–259. **Vacher.**
La géographie économique de l'Argentine, à propos d'ouvrages récents. Par Antoine Vacher.

Bolivia. ———
Oficina Nacional de Inmigración, Estadistica y Propaganda Geográfica. Division Político-Administrativa de la República de Bolivia. La Paz, 1902. Size 13 × 8, pp. 24.

Bolivia. **Suarez.**
Notes on Bolivia, compiled and prepared from different sources by Pedro Suarez. London: Unwin Brothers, 1902. Size 8½ × 5½, pp. 80. *Maps and Illustrations. Presented by the Author.*

Bolivia—Boundaries. **Guzmàn.**
Fronteras de Bolivia. Discusion con la Prensa de Chile acerca de la soberania de Bolivia en Chilcaya. Por Alcibiades Guzmàn. La Paz, 1902. Size 7½ × 6, pp. 104. *Presented by the Oficina Nacional de Inmigración.*

Bolivia and Peru. ———
Monthly B. Internat. Bureau American Rep. **12** (1902): 1408–1411.
General Arbitration Treaty celebrated between Bolivia and Peru.

The treaty was signed at La Paz on November 21, 1901.

Brazil—Ceará. *Globus* **82** (1902): 1–5. **Katzer.**
Der landschaftliche Charakter von Ceará (Brasilien). Von Dr. Friedrich Katzer. *With Illustrations.*

Central America—Panama Canal. **Burr.**
Popular Sci. Monthly **61** (1902): 252–268, 304–316.
The Panama Route for a Ship Canal. By Prof. William H. Burr. *With Map and Illustrations.*

Chile. **Hume.**
A Lecture on "The Republic of Chili," including Patagonia, Straits of Magellan, Tierra del Fuego, also Juan Fernandez, given at Junior Constitutional Club, Piccadilly, by Captain David E. Hume, on Thursday, April 10, 1902. London, 1902. Size 8 × 5½, pp. 16. *Presented by the Author.*

Guiana. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **19** (1902): 604–606. **Bakhuis.**
Een grenskwestie. Door L. A. Bakhuis.

On a still doubtful point in the boundary between French and Dutch Guiana.

Honduras. *Z. Ges. Erdk. Berlin* (1902): 143–164, 231–241. **Sapper.**
Beiträge zur physischen Geographie von Honduras. Von Dr. Karl Sapper. *With Map.*

A careful account of the present position of the Panama canal question, with description of the operations necessary. A comparison with the Nicaragua scheme leads to the conclusion that both are feasible, and no decided advantage in favour of either is shown to exist.

Peru. **St. John.**

Trade and General Condition of Peru for the year 1901. Foreign Office, Annual No. 2807, 1902. Size 9½ × 6, pp. 42. *Price 2½d.*

Salvador—Lake Ilopango. *B.R.S.G. Madrid* **43** (1901): 391-397. **Pena.**

El lago de Ilopango. Por D. José Maria S. Peña.

South America. *Globus* **81** (1902): 1-7, 39-46, 69-78, 105-112. **Koch.**

Die Guaikurústämme. Von Theodor Koch. *With Illustrations.*

Tierra del Fuego. **Arçtowski.**

Voyage d'exploration dans la région des canaux de la Terre de Feu. Par Henryk Arçtowski. Bruxelles, 1902. Size 9 × 6½, pp. 34. *Map.*

Uruguay. **Arçtowski.**

Note sur les Dunes du cap Polonio sur la côte de l'Uruguay. Par Henryk Arçtowski.—Notice sur l'abrasion glaciaire, by the same. (Extrait du Bulletin Soc. Belge Géologie, etc., Tome xv., 1901.) Bruxelles, 1902. Size 9½ × 6½, pp. 689-702. *Maps. Presented by the Author.*

Uruguay. **Urioste**

El Clima del Uruguay. Antero Urioste. Size 6½ × 5, pp. 8.

Uruguay—Meteorology. ———

Sociedad Meteorológica Uruguaya. Servicio Pluviométrico. Director: D. Francisco A. Lanza. Resumen de las Observaciones Pluviométricas efectuadas durante el 1er (2o, 3er, 4o) trimestre del año de 1899. Año viii. Montevideo, 1902. Size 11 × 7½, pp. 7, 7, 7, and 7.

Venezuela. *Deutsch. Rundschau G.* **24** (1902): 337-348, 398-407. **Olinda.**

Venezuela in der Gegenwart, Geschildert nach eigenen Eindrücken und Anschauungen. Von Dr. Alexander Olinda. *With Map and Illustrations.*

West Indies. *National G. Mag.* **13** (1902): 209-216. ———

The National Geographic Society Expedition in the West Indies. *With Map.*
Volcanic Islands of West Indies. *With Map.*
Lafcadio Hearn on the island and people of Martinique.

West Indies. *Scottish G. Mag.* **18** (1902): 369-377. **Falconer**

The Evolution of the Antilles. By J. D. Falconer. *With Illustration.*

West Indies. *Popular Sci. Monthly* **61** (1902): 272-281. **McGee.**

The Antillean Volcanoes. By Dr. W J McGee.

West Indies—Martinique. *C. Rd.* **135** (1902): 71-72. **Thierry.**

Sur l'éruption volcanique du 8 mai à la Martinique. Note de M. Thierry.

West Indies—Martinique. *Deutsch. Rundschau G.* **24** (1902): 455-461. **Umlauft.**

Die Katastrophe auf Martinique. Von Prof. Dr. Friedrich Umlauft. ***With Map.***

West Indies—Martinique and St. Vincent. **Jaggar.**
Popular Sci. Monthly **61** (1902): 352-368.

Field Notes of a Geologist in Martinique and St. Vincent. By Dr. **Thomas** Augustus Jaggar. *With Illustrations.*

West Indies—Volcanic Eruptions. *Z. Ges. Erdk. Berlin* (1902): 419-427. **Deckert.**

Die westindische Vulkankatastrophe und ihre Schauplätze. Von **Dr. Emil** Deckert. *With Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. *Nineteenth Century* **52** (1902): 43-54. **Douglas.**

Asia and Australasia. By the Hon. John Douglas, C.M.G.

On the possibility of the development of Northern or tropical **Australia, without** recourse to the immigration of Asiatics.

Australia and Tasmania. **North.**

Nests and Eggs of Birds found breeding in Australia and Tasmania. **By Alfred** J. North. (Australian Museum. Sydney Special Catalogue, No. i. **Second** Edition of Catalogue No. xii. entirely re-written, with additions. **Part ii.)** Sydney, 1902. Size 12½ × 9½, pp. 37-120. *Plates and Illustrations.* ***Presented*** *by the Trustees of the Australian Museum.*

Dutch New Guinea. ——

Tijds. K. Ned. Aard. Genoots. Amsterdam 19 (1902): 586–592.

De Mrouwke-rivier. *With Map.*

This river enters the sea on the south coast, west of the British boundary.

Dutch New Guinea. **Koning and Oosterzee.**

Tijds. K. Ned. Aard. Genoots. Amsterdam 19 (1902): 592–603.

Het Santani-meer. Het Cycloop-gebergte. De Wilhelmina of Tami-river.

Extracts from reports on visits to the north coast of Dutch New Guinea, near the German boundary.

German New Guinea—Pelew Islands. **Senfft.**

Deutsch. Kolonialblatt 13 (1902): 263–264.

Ueber einen Besuch der Palau-Inseln.

Queensland.—Ethnography. **Roth.**

1902. Queensland. Home Secretary's Department, Brisbane. North Queensland Ethnography. Bulletin No. 4. March, 1902. Games, Sports, and Amusements. By Walter E. Roth. Brisbane, 1902. Size 13 × 8½, pp. 24. *Illustrations. Presented by the Home Secretary, Brisbane.*

Samoa. *Z. Ges. Erdk. Berlin* (1902): 411–418. **Wegener.**

Samoa, Land und Leute. Von Dr. Georg Wegener. *With Illustrations.*

Western Australia. **Brockman.**

Western Australia. Report on Exploration of North-West Kimberley, 1901. By Fred. S. Brockman, with Appendices by Chas. Crossland and Dr. F. M. House. Perth, 1902. Size 13 × 8½, pp. 60. *Map and Illustrations.*

See note in the Monthly Record (*ante*, p. 456).

POLAR REGIONS.

Antarctic—German Expedition. **Drygalski.**

Deutsche Südpolar-Expedition auf dem Schiff *Gauss* unter Leitung von Erich von Drygalski. Bericht über die wissenschaftlichen Arbeiten auf der Fahrt von Kiel bis Kapstadt 11. August bis 27. November 1901 und die Errichtung der Kerguelen-Station, mit Beiträgen von Bidlingmaier, v. Drygalski, Enzensperger, Gazert, Philippi, Ruser, Stehr, Vanhöffen, Werth. (Veröffentlichungen des Instituts für Meereskunde und des Geographischen Instituts an der Universität Berlin. Herausgegeben von deren Direktor Ferdinand Frhr. v. Richthofen. Heft I. März 1902.) Berlin: E. S. Mittler und Sohn. Size 10½ × 7½, pp. 108. *Maps and Diagrams.*

This is reviewed at p. 222, *ante.*

Arctic. **Nathorst.**

Föreningen Heimdals Folkskrifter 74. Polarforskungen af A. G. Nathorst. Stockholm. P. A. Norstedt & Son. Not dated. Size 8 × 5, pp. 30. *Map. Price* 25 *öre. Presented by the Author.*

MATHEMATICAL GEOGRAPHY.

Astronomy. **Crommelin.**

An Adaptation of Major Grant's Graphical Method of predicting Occultations to the Elements now given in the Nautical Almanac. By A. C. D. Crommelin. London: Royal Geographical Society, 1902. Size 10 × 6, pp. 6. *Diagrams.*

Cartography. **Penfield.**

The Stereographic Projection and its Possibilities, from a Graphical Standpoint. By Samuel L. Penfield. New Haven, Conn.: Tuttle, Morehouse & Taylor Co., 1901. Size 9 × 6, pp. 54. *Diagrams. Presented by the Author.*

Reprint of an article which appeared last year in the *American Journal of Science.*

Longitudes. **Weiss and Schram.**

Publicationen für die Internationale Erdmessung. Astronomische Arbeiten des K. K. Gradmessungs-Bureau, ausgeführt unter der Leitung des Hofrathes Theodor v. Oppolzer. Nach dessen Tode herausgegeben von Hofrath Prof. Dr. Edmund Weiss und Dr. Robert Schram. XII. Band. Längenbestimmungen. Wien, etc. F. Tempsky, 1900. Size 12 × 9½, pp. viii. and 176.

Map-Projection. *Ann. Hydrographie* 30 (1902): 343–347. **Kleritj.**

Konstruktion der Parallelkreisbilder im Netze der Mercator-Projektion. Von Prof. Ljub. Kleritj.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Botanical Geography. *Ann. G.* 11 (1902): 193-202. **Bonnier.**

La Géographie botanique expérimentale. Par Gaston Bonnier.

See note in the August number (p. 234, *ante*).

Glacial Epoch. *C. Rd.* 135 (1902): 124-126. **Martin.**

Faits nouveaux ou peu connus, relatifs à la période glaciaire. Note de M. David Martin.

Oceanography. ———

List of Oceanic Depths and Serial Temperature Observations received at the Admiralty during the year 1901, from H.M. Surveying Ships, Indian Marine Survey and British Submarine Telegraph Companies. Hydrographic Department, Admiralty, London, 1902. Size 13 × 8½, pp. 46. *Presented by the Hydrographic Department, Admiralty.*

Oceanography. *C. Rd.* 134 (1902): 1606-1607. **Thoulet and Chevallier.**

Sur la densité des eaux océaniques. Note de MM. Thoulet et Chevallier. (Extrait.)

Oceanography—Atlantic. **Richard.**

Campagne Scientifique de la "Princesse Alice" en 1901. Par le Dr. J. Richard. (Extrait du *Bulletin de la Société Zoologique de France*, Année 1902, pp 81-104.)

Oceanography—Currents. *Asien* 1 (1902): 138-140. **Livonius.**

Der Golfstrom und der Kuro-Siwo. Von O. Livonius.

Oceanography—North Atlantic. **Lundbeck.**

The Danish Ingolf-Expedition, vol. vi. Part i. Porifera (Part i.) Homorrhaphidæ and Heterorrhaphidæ. By Will. Lundbeck. Translated by Torben Lundbeck. Copenhagen: H. Hagerup, 1902. Size 13 × 10½, pp. 108. *Plates. Presented by the Zoological Museum, Copenhagen.*

Physical Geography. *Vierteljahrs. G. Unterricht.* 1 (1902): 203-211. **Machaček.**

Eduard Suess, Das Antlitz der Erde. III. Band, I. Th. Von Dr. Fritz Machaček.

A detailed analysis of the work.

Terrestrial Magnetism. *Ann. Hydrographie* 30 (1902): 299-304. **Sachse and Koldewey.**

Magnetische Beobachtungen an Bord der "Valdivia" während der deutschen Tiefsee-Expedition 1898-99. Ausgeführt vom Navigationsoffizier Herrn W. Sachse. Bearbeitet von Admiralitätsrath Koldewey.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography—Crime. **Reiner.**

Deutsch. Rundschau G. 24 (1902): 395-398.

Das Verbrechen vom Standpunkte der Geographie. Von Dr. Julius Reiner.

Commercial Geography. **Dubois, Kergomard, and Laffitte.**

Précis de Géographie Économique par MM. Marcel Dubois et J. G. Kergomard. Deuxième Édition revue et corrigée avec la collaboration de M. Louis Laffitte. France, Europe, Asie, Océanie, Afrique, Amérique. Paris: Masson et Cie., 1903 [1902]. Size 9 × 5½, pp. viii. and 838. *Price* 8 *fr. Presented by the Publisher.*

BIOGRAPHY.

Adams. *M. Deutsch. Ges. Natur- u. Völkerk. Ostasiens* 8 (1902): 239-253. **Reiss.**

William Adams und sein "Grab" in Hemimura. Von Ludwig Reiss.

Prof. Reiss, whose researches into the early dealings of Europeans with Japan have extended over some years, comes to the conclusion that Adams was buried at Hirado, where he died, though a monument was erected by his friends at Hemimura.

Bettoni. *B.S.G. Italiana* 3 (1902): 487-493. **Bertacchi.**

Angela Bettoni-Palermo, già vedova Haimann, e l'illustrazione della Cirenaica. Di Cosimo Bertacchi.

Signora Bettoni accompanied her husband, Giuseppe Haimann, during his expedition to Tripoli in 1881. She was born in 1848, and died at Rome in April last.

Brahe. **Burckhardt.**
Zur Erinnerung an Tycho Brahe 1546–1601. Vortrag gehalten am 23 Oktober 1901 in der Naturforschenden Gesellschaft in Basel 300 Jahre nach dessen Tode. Von Fr. Burckhardt. Basel: Georg & Co., 1901. Size 9 × 5½, pp. 26. *Facsimile.*

Gaboury. **Dugast.**
The First Canadian Woman in the North-West, or the Story of Marie Anne Gaboury, Wife of John Baptiste Lajimonière, who arrived in the North-West in 1807, and died at St. Boniface at the Age of 96 years. By M. L'Abbé G. Dugast. (Historical and Scientific Society of Manitoba. Transaction No. 62.) Winnipeg, 1902. Size 9 × 5½, pp. 32. *Presented by the Historical and Scientific Society of Manitoba.*

Haënke. *B.R.S.G. Madrid* **43** (1901): 310–323. **Duro.**
Tadeo Haënke. Naturalista en el viaje alrededor del mundo de las corbetas *Descubierta* y *Atrevida*, al mando de D. Alejandro Malaspina, desde 1789 á 1794. Por D. Cesáreo Fernández Duro.

Nieuwenhuis. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **19** (1902): 553–577. **Hasselt.**
Feestrede ter gelegenheid van de plechtige ontvangst van Dr. A. W. Nieuwenhuis te Amsterdam, uitgesproken door Prof. A. L. van Hasselt.

Describes the work of the well-known explorer of Borneo.

Scherzer. **Reingruber.**
Gallerie denkwürdiger Personen der K. K. Hof- und Staatsdruckerei. Von Josef Reingruber. [Dr. Karl Ritter von Scherzer.] Size 7½ × 5½, pp. 139–158. *Portrait. Presented by Dr. Karl v. Scherzer.*

Dr. von Scherzer, who is an honorary corresponding member of our Society, is best known to geographers for the part he took in the voyage of the *Novara* in 1857–59.

GENERAL.

Educational. *Vierteljahrs. G. Unterricht.* **1** (1902): 220–224. **Mosshammer.**
Die symmetrischen Erinnerungsbilder beim memorialen geographischen Zeichnen. Von Dr. Franz Mosshammer. *With Diagrams.*

On the difficulties arising from reversed mental pictures, especially in the case of left-handed or ambidextrous pupils, in the drawing of maps from memory.

Encyclopædia Britannica. ———
The New Volumes of the Encyclopædia Britannica, constituting, in combination with the existing volumes of the Ninth Edition, the Tenth Edition of that work, and also supplying a New, Distinctive, and Independent Library of Reference dealing with recent events and developments. Vols. xxv., xxvi., and xxvii. of the complete work. Edinburgh and London: A. & C. Black and the *Times*, 1902. Size 11½ × 9, pp. (vol. xxv.) (A.–Aus.) xiv. and 808; (vol. xxvi.) (Aus.–Chi.) xxii. and 764; (vol. xxvii.) (Chi.–Eld.) xx. and 744. *Maps and Illustrations.*

These will be specially noticed.

Geography. *Riv. G. Italiana* **9** (1902): 217–240. **Marinelli.**
Alcune questioni relative al moderno indirizzo della geografia. Per Prof. Olinto Marinelli.

Ocean Routes. **Chave.**
Distances, Courses, and Maritime Positions on the Routes of the Union Castle Line Steamers between England, the Continent, and South Africa, Madagascar, and Mauritius. Computed and arranged by Benjamin Chave. 1899. Second Edition. Southampton and London. Size 6 × 5, pp. 22. *Price* 1*s.* 6*d.* *Presented by the Author.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Central Europe. **Liebenow and Ravenstein.**
Liebenow-Ravenstein's Special-Radfahrerkarte von Mittel-Europa. Scale 1 : 300,000 or 4·7 stat. miles to an inch. Sheets: 84, Köln; 98, Prüm. Frankfurt-a-M.: Ludwig-Ravenstein.

This map is now published in two forms, one being a revision of the earlier topographical and political edition, and the other, based upon the former, an edition showing roads in red, distances between places in kilometres, and other information likely to be of service to cyclists and automobilists, for whom it has been specially prepared. The character of each road is indicated by the style in which it has been drawn. When complete, the map will consist altogether of a hundred and sixty-four sheets, of which about ninety are now published. The above sheets belong to the cyclists' edition of the map.

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—**Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from August 1 to 31, 1902.**

1 inch:—

With hills in brown or black, 84, 115, 149, 166 (engraved). 1*s. each.*

6-inch—County Maps:—

Cambridgeshire, 24 S.E., 28 N.E., 32 S.E. **Dorsetshire,** 3 S.E., 4 N.W., 7 S.E., 8 S.E., 14 N.W., N.E., S.W., 15 N.W., S.W., 16 N.W., N.E., S.W., 17 N.W., S.W., 23 S.E., 24 N.W., N.E., 25 N.E., S.W., S.E., 26 N.W., N.E., 33 N.E., S.W , S.E., 34 N.W., S.E., 35 N.E., S.E., 56 S.W., 57 N.W., 59 N.W., N.E. **Huntingdonshire,** 15 S.E., 18 N.E., 19 N.E., S.W., 22 S.E. **Monmouthshire,** 3 N.W., 4 N.W., 30 N.W., 31 N.W. **Shropshire,** 1 S.E. **Staffordshire,** 45 N.W., S.W., 46 N.W. 1*s. each.*

25-inch—County Maps:—

Cambridgeshire, IV. 1; XVII. 14; XXII. 11, 14, 15, 16; XXIII. 1, 5; XXV. 3, 13, 16; XXVI. 2, 3, 4, 5, 6, 9, 12, 13, 16; XXVII. 2; XXIX. 3; XXX. 1, 2, 5; XXXVIII. 8, 12; XLV. 4, 8, 12, 13, 14, 15, 16; LI. 4; LII. 1, 3, 4, 6, 7, 8, 10, 11, 12, 14; LVII. 2, 6. **Dorsetshire,** XXII. 2, 4, 7, 8, 9, 10, 12, 14; XXXI. 2, 6; XXXIX. 12; XL. 1, 4, 5, 6, 7, 16; XLVII. 1, 5, 6, 13; LIII. 8; LV. 5, 9. **Gloucestershire,** X. 4; XXV. 11, 16; XXX. 11, 12, 15; XXXI. 1, 2, 5, 6, 16; XXXIII. 3, 4, 6, 7; XXXIV. 10, 11, 12, 14; XXXV. 14; XXXVI. 2, 3, 6, 16; XXXVIII. 7; XL. 7; XLIX. 3, 8; LIX. 2. **Huntingdonshire,** XXVIII. 4, 8, 12, 13. **Montgomeryshire,** XXIII. 16; XXX. 2, 3, 4, 9, 10, 11, 13, 14, 15; XXXVI. 10, 11, 15; XXXVII. 3; XLI. 5, 6, 7, 8, 10. 15; XLII. 8, 13, 15, 16; XLIII. 1. **Shropshire,** XXXIV. 11; XXXVI. 12; XXXVII. 15, 16; XXXVIII. 13; XLI. 10, 11; XLII. 1, 2, 3, 5, 6, 9, 11; XLIV. 3, 4, 6, 7, 8, 10, 12, 14, 15, 16; XLV. 1, 5, 9; LII. 2, 3, 4, 8; LIIA. 1. **Staffordshire,** XXII. 2, 3, 9, 14; XXVII. 4; XXVIII. 5, 6, 7, 11, 12, 15, 16; XXXV. 4, 7, 11; LVI. 1, 2, 5, 9, 10, 11, 12, 13; LVII. 1, 3, 6, 8, 13; LXII. 3, 4; LXIII. 1, 4; LXIV. 1; LXV. 1, 2. **Worcestershire,** XV. 3, 4; LIII. 16. **Yorkshire,** CCXC. 12; CCXCI. 9; CCXCVI. 2, 3, 4, 7, 8, 10, 11, 12. 3*s. each.*

England and Wales. **Geological Survey.**

Maps (1-inch). New Series (colour printed). Ringwood, Sheet 314. *Price* 1*s.* 6*d.* (Drift Edition.)

MEMOIRS:—

Exeter, Geology of the country around, 2*s.* (Explanation of sheet 325.)
Ringwood, Geology of the country around, 1*s.* (Explanation of sheet 314.)
Southampton, Geology of the country around, 1*s.* 6*d.* (Explanation of sheet 315.)
(*E. Stanford, London Agent.*)

England and Wales. **Bartholomew.**

Cyclists' Road Map of the Birmingham District. Reduced from the new revised Ordnance Survey. Scale 1 : 126,720 or 2 stat. miles to an inch. Edinburgh: John Bartholomew & Co., 1902. *Price* 1*s.* 6*d.*, *mounted on cloth. Presented by the Publishers.*

Except that the main roads are shown in brown, this map is uncoloured. Contour lines are shown, but no orographical tinting. This sheet extends from Eccles on the north to Evesham on the south, and from Shrewsbury on the west to Leicester on the east.

England and Wales. **Bartholomew.**

Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheet 11, North Wales. Edinburgh: John Bartholomew & Co. *Price* 2*s. mounted on cloth. Presented by the Publishers.*

This sheet includes the whole of Anglesey and Carnarvon, and portions of Merioneth, Denbigh, and Flint. Like the rest of the series to which it belongs, the relief is very clearly shown by contour lines and carefully selected tints of colour. The character of the roads is clearly indicated by the style in which they are drawn, and altogether the map will doubtless be most serviceable to cyclists and tourists generally.

Italy. **Instituto Geografico Militare, Florence.**

Carta d'Italia. Scale 1 : 100,000 or 1·5 stat. mile to an inch. Sheets: 109, Pesaro; 115, Citta di Castello; 116, Gubbio; 117, Jesi; 123, Gualdo Tadino; 124, Macerata, 125, Fermo; 131, Foligno; 132, Norcia; 133, Ascoli Piceno; 135, Orbetello. Instituto Geografico Militare, Florence, 1900.

Norway. **Norges Geografiske Opmaaling.**

1. Topografisk kart over kongeriget Norge. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheets: J 15, Svartisen; K 15, Dunderlandsdalen; L 15, Nasa. 1902. *Price kr.*0.60 *each sheet.* With index.—2. Kart over Sondre Trondhjems Amt. Scale 1 : 200,000 or 3·2 stat. miles to an inch. 1901. *Price kr.*1.00. Christiania: Norges Géografiske Opmaaling. *Presented by Col. G. E. Church.*

AFRICA.

Eritrea. **Instituto Geografico Militare, Florence.**

Carta della Eritrea. Scale 1 : 100,000 or 1·5 stat. mile to an inch. Sheets: 1, Valle del Giaghe; 2, Mai Adartè; 8, Agordat; 9, Dega; 10, Melanzane; 15, Suzenà; 16, Ferfer; 17, Mai Albò; 22, Tolè. Florence: Instituto Geografico Militare. *Price lire* 1.5 *each sheet.*

Tunis. **Service Géographique de l'Armée, Paris.**

Tunisie. Scale 1 : 50,000 or 0·78 stat. mile to an inch. Sheets: Nos. XXXV., Zaghouane; XLII., Djebel Fkirine; XLIII., Enfida; LXIV., Sidi el Hani; LXXIV., Mahdia; LXXXII., La Chebba. *Price* 1.50 *fr. each sheet.*—Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheets: Nos. XXVIII. Djebel Harraba; XXIX., Ksour; LI., Djebeniana. *Price* 1.50 *fr. each sheet.* Service Géographique de l'Armée, Paris.

AMERICA.

Brazil. **Pessanha.**

Carta do territorio do Aricary incorporado ao Estado do Pará, Republica dos E. U. do Brazil. Execução e desenho de José Lobo Pessanha. Scale 1 : 2,000,000 or 31·5 stat. miles to an inch. Para, 1901. *Presented by W. A. Churchill, Esq.*

Shows the territory awarded to Brazil by the decision of the Swiss Government Arbitration in December, 1900, as well as the finally arranged boundary between French Guiana and Brazil. It is merely a sketch-map, with little detail.

Martinique. **Epois.**

Carte générale de la Martinique publiée sous le patronage du Government de la Martinique. Dressée d'après la Carte du Service Hydrographique de la Marine et complétée par M. J. Epois, d'après les documents officiels de la Colonie. Scale 1 : 80,000 or 1·2 stat. mile to an inch. Paris: Augustin Challamel. 1902.

This general map of Martinique is on a sufficiently large scale to show a fair amount of detail. It has been compiled from the latest available information previous to the disastrous volcanic eruptions which have considerably modified the physical features of the northern part of the island. These changes are not indicated, but doubtless a new edition will be published before long upon which they will be shown, and a comparison of the two will be interesting. The map is well drawn, and printed in colours.

GENERAL.

World. **Sohr-Berghaus.**

Neuer zeitgemässer Bearbeitung von Sohr-Berghaus Hand-Atlas über alle Teile der Erde, herausgegeben von Prof. Dr. Alois Bludau. Früher herausgegeben von F. Handtke. Neunte Auflage. Lieferung I. Glogau: Carl Flemming, 1902. *Price* 1 *m. each part.*

This is the first part of the ninth edition of a popular German atlas, which has been corrected and brought up to date. When complete it will consist altogether of eighty-four sheets, with over a hundred and fifty maps, and is to be published in thirty parts, each containing two or three sheets. One part will be published every three or four weeks, at a uniform price of one mark. The present issue contains the following maps: No. 8, Europe, physical, 1 : 15,000,000; No. 61, Africa, physical, 1 : 20,000,000; No. 66, the north-eastern sheet of a general map of Africa, in five sheets, on the scale of 1 : 10,000,000. The first two maps show relief by a combination of hachuring and colour tinting, with a result that cannot be considered altogether satisfactory, and the latter, though containing a great deal of information, is somewhat overcrowded and indistinct. On all the maps the depths of the ocean are indicated by tints of blue.

World. **Stieler**

Neue, neunte Lieferungs-Ausgabe von Stielers Hand-Atlas, 100 Karten in Kupferstich. 8 Lieferung. Sheets, Nos. 80 and 84. Gotha: Justus Perthes. *Price* 60 *pf.*

The two maps contained in this part of the new edition of Stieler's Hand-Atlas are —No. 80, the south-east sheet of a map of Australia, on the scale of 1; 5,000,000, by Dr. H. Haack, and No. 84, Eastern Canada, on the scale of 1 : 7,500,000, by H. Habenicht. The former includes Southern Queensland, New South Wales, Victoria, and the eastern part of South Australia, and the latter all that portion of the Dominion of Canada south of Hudson strait, and east of the western shores of Hudson bay. Both are entirely new maps, and most creditable productions.

CHARTS.

North Atlantic Ocean and Mediterranean. **Meteorological Office, London.**

Pilot Chart of the North Atlantic and Mediterranean for September, 1902. London: Meteorological Office. *Price 6d. Presented by the Meteorological Office, London.*

Norway. **Norges Geografiske Opmaaling.**

Specialkarte over den Norske Kyst fra Uro til Brottesnes. Scale 1 : 50,000 or 0·8 stat. mile to an inch. Christiania: Norges Geografiske Opmaaling, 1902. *Price kr.*1.00. *Presented by Col. G. E. Church.*

Norway. **Norges Geografiske Opmaaling.**

Oversigtskart i 1: 2,400,000 over de af Norges Geografiske Opmaaling udgivne Kystkarte samt over Dyblodningen til 1ste April 1902. Christiania: Norges Geografiske Opmaaling. *Presented by Col. G. E. Church.*

U.S. Charts. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for August, and of the North Pacific for September, 1902. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Argentine Republic. **Sociedad Fotografica Argentina de Aficionados.**

One hundred and twenty Photographs of the Argentine Republic, taken by the Sociedad Fotografica Argentino de Aficionados. *Presented by Colonel Sir Thomas H. Holdich, R.E., K.C.I.E., C.B.*

These fine large photographs have been mounted and bound in seven handsome albums. As will be seen from the titles, the greater number of them represent the Argentine army and navy, and government institutions and public buildings of Buenos Aires and La Plata. They have been brought home by Sir Thomas Holdich on his return from his recent visit to South America in connection with the Chilo-Argentine Boundary Arbitration, and presented by him to the Society.

Buenos Aires: (1) Naval school; (2) Cadets of the naval school; (3) Workshops of the naval arsenal; (4-16) Battleships and cruisers of the Argentine Republic; (17) Infantry of the military school; (18) Cavalry of the military school; (19) Artillery of the military school; (20) A company of the 10th Regiment of Infantry; (21) The 2nd Regiment of Artillery; (22 and 24) 9th Cavalry Regiment of Guards (President's escort); (23) Squadron of guards; (25) Corps of bombardiers; (26) Military arsenal; (27) Military hospital; (28) Tiro federal; (29-32) Government buildings; (33) Vestibule, Government buildings; (34) House of Congress; (35) National Supreme Court; (36) Central department of police; (37) National penitentiary; (38) Facultad de Medicina; (39) Facultad de Ciencias y Letras; (40 and 41) Escuela Normal de Profesores; (42) Colegio Petronila Rodriguez; (43) Colegio Sagrado Corazón; (44) Colegio Avellaneda; (45) Colegio Sarmiento; (46) Escuela Graduada de Varones; (47) Colegio Zorrilla; (48) Caja de Conversion; (49) Municipalidad; (50) Aguas Corrientes bank; (51) Aguas Corrientes pumping station; (52) Aguas Corrientes reservoirs; (53) Commercial exchange; (54) Teatro Colon; (55) Teatro opera; (56) Teatro Argentino; (57) South railway station; (58) west railway station; (59) Casa Amarilla; (60) Pabellon Argentino; (61) Bon Marché; (62) Hotel Metropole; (63) Splendid hotel; (64) Jockey club (exterior); (65) Jockey club (interior); (66) Club del Progreso; (67) Editorial offices of *La Nacion*; (68)

Editorial offices of *La Prensa*; (69) Asistencia Publica; (70 and 71) Asilo Mendigos; (72) Hospital Rawson; (73) Children's hospital; (74) Aliens' hospital; (75) Hospital Rivadavia; (76) Entrada Chacarita; (77) The cathedral; (78) Santa Domingo church; (79) Nuestra Señora de la Merced church; (80) Carmen chapel; (81) Santa Felicitas church; (82) Padres Pasionistas church; (83) Interior of dome of Salvador church; (84) Interior of the Padres Pasionistas church; (85 and 86) Plaza de Mayo; (87 and 88) Avenida de Mayo; (89) Belgrano's statue; (90, 96, and 97) Avenida Alvear; (91) Plaza Libertad; (92) Calle Callao; (93) General S. Martin's statue; (94) Calle Sta. Fe; (95) General view of the convent gardens; (98) Sarmiento's statue; (99 and 100) Landscape, Palermo; (101) Grand stand on the racecourse; (102) Racecourse; (103) South docks; (104) Shipping scene; (105) New model market; (106) Central fruit market; (107) Frozen meat stores.—La Plata: (108) Government buildings; (109) Legislatura; (110) Municipal buildings; (111) Direction of schools; (112) The museum; (113) Law Courts.—(114) Brewery, Quilmes; (115) Law Courts, Rosario Santa Fe; (116) The cathedral, Salta; (117-120) Views in Tierra del Fuego.

Canada. **Wheeler.**

Seven Photographs of the Selkirk Range, Canada. Taken by A. O. Wheeler, Esq. *Presented by A. O. Wheeler, Esq.*

An excellent set of photographs, measuring about 9 × 12 inches. The following are the titles:—

(1) The Canadian Pacific Railway in the Illecillewaet valley; (2) The Illecillewaet valley; (3) Mount Sir Donald and the Illecillewaet glacier; (4) Stony creek and Mount Shaughnessy; (5) Stony creek bridge and Beaver river valley; (6) Looking north from Rogers pass; (7) Mts. Cheops and Napoleon.

India. **Crookshank.**

Twenty-seven Photographs of Kashmir. Taken by Lieut. A. A. Crookshank, R.E. *Presented by Lieut. A. A. Crookshank, R.E.*

A most successful series of photographs taken during the summer and autumn of 1900, interesting alike from a geographical and anthropological point of view.

(1) Group of Mohammedans of Akhu, Chinese Turkistan, returning from a pilgrimage to Mecca, photographed at Drás; (2) Village of Gya, south of Leh; (3) Camp of Chámpas at Debring, near Takalang pass, black tents of yák's and goat's hair; (4) The larger of two salt lakes, "Tsokar," in Rukshu, looking east and south-east across the lake from north-west corner, altitude 14,900 feet; (5) The larger of two salt lakes, "Tsokar," looking north-east across the lake from Rigul; (6) View of both salt lakes, called "Tsokar," from hills above Pizuli camp, Lieut. Crookshank's Kashmiri Shikari in foreground; (7) "Karzok" (upper) chief encampment of the Chámpas, on west shores of Tso-Moriri lake—snow hills behind are 20,600 feet; (8) Tso-Moriri lake in Rukshu, altitude 14,900 feet; (9) Tso-Moriri lake from centre of east shore looking west, snow hills behind are same as seen in photograph No. 7; (10) Winter quarters of the chief of the Chámpas, near lake Lam Tso Tagazung, Rukshu, altitude 15,000 feet; (11) The Ovis Ammon—horns are 38 inches long; (12) The Goa or Tibetan gazelle, horns 14½ inches long; (13) Lake at head of Lamambum Nullah, east of Chumár Tagazung, altitude over 20,000 feet; (14) Snow-peaks, altitude 21,176 feet, south-west of Chumár, with the Parechu or Párang-tso river below; (15) Snow-range (nearest peak 21,176 feet) lying to the south-west of Chumár; (16) The Tso-Moriri lake, from hills to the south-south-east, snow-peaks behind 20,600 feet, east of Nurbu-Sumdo; (17) The Tso-Moriri lake, from hills to the south, view up the lake from the north; (18) Rockoláma Nullah, drains into the Parechu river from the south and about midway between Nurbu-Sumdo and the Párang Lá; (19) Looking down the Parilungbi river in Spiti from below the Párang Lá pass; (20) The Parilungbi river north of Kibber village in Spiti; (21) Snow-clad peaks in Spiti, east of Kibber village; (22) Village of Kibber in Spiti; (23) Village of Ki in Spiti, on the Spiti river; (24) The burhel of Spiti, horns 22 inches long; (25) Red bear of Spiti at Lursa; (26) The suspension bridge over the Sutlej river at Wangtu; (27) The valley between Paunda and Taranda on the Hindustan-Tibet road, upper Sutlej valley.

Naga Hills. **Furness.**

Forty-seven Photographs of the Naga Hills, Northern Assam. Taken by Dr. W. H. Furness. *Presented by Dr. W. H. Furness.*

This album forms a valuable addition to the Society's collection, especially as Dr. Furness has been careful to select subjects of geographical interest. The natives, their dwellings, and mode of life are all represented, as well as the scenery of the region.

The photographs are platinotypes, measuring about 4½ × 6½ inches. Their titles are as follows:—

(1) View over the Naga hills from Koio; (2) "Morang" or batchelors' house of the village of Tamlu, Miri Nagas; (3) The headman of the middle "Khel" or ward of Tamlu; (4) Wood-carriers, Tamlu; (5 and 6) Sacred tree in burying-ground at Tamlu; (7) Head-hunters trophies hanging beneath the eaves of a house at Tamlu; (8) Headman of Naogong in war costume, Ao Nago: (9) Village of Naogong; (10) Heads made of gourds and of wood to recall a head-hunting raid; (11) Street in Naogong; (12) The front of a house, Naogong; (13) Interior of an Ao Naga house, Naogong; (14) Front of the "Morang" and public council platform, Naogong; (15) Wooden gong on which the alarm is struck in times of attack on the village; (16) Ao Nagas—the collars of boar tusks on the men indicate successful head-hunters; (17) Ao Nagas; (18) A sacrificed dog being cut in small pieces with a knife of bamboo, and distributed throughout the village, thereby effecting a cure for fever; (19) Graveyard at Naogong; (20) Wild bull of the Naga hills (Bos frontalis); (21) Ao woman, village of Nunkum; (22) Ao woman; (23) The headman of Nunkum, Ao Nagas; (24) Unmarried girls of Hungtang, Sema Nagas; (25) Sema Nagas; (26) Weaving, Sema Nagas, Hungtang; (27) Women of Sema tribe carding cotton; (28) Married woman of Hungtang, Sema Naga; (29) The front posts of a "Morang"; (30) Recently made grave hung with the possessions of the deceased; (31) Rengma Naga woman; (32) Rengma Naga, Kotsana; (33) Front of "Morang" in Rengma, Naga village; (34) Rengma children; (35) Side view of a "Morang;" (36) Beggars in a Rengma village; (37) Nerhama, Angami Nagas; (38) House of a rich man of Nerhama; (39) Angami Naga youths, carrying horns of "Zu," a mild rice-beer; (40) Angami woman; (41–43) An Angami war-dance; (44) Angamis in festival costume; (45) A monumental boulder dragged into a village to commemorate a feast given by a rich man as a tribute to the memory of his dead father; (46) The house of the wealthy citizen who gave the feast, Maothana Angami Nagas; (47) Tunkhul Nagas.

New Guinea. **Guise.**

Five Photographs of native tattooed women of British New Guinea. Taken by R. E. Guiso, Esq. *Presented by R. E. Guise, Esq.*

In 1900 Mr. Guise presented an important set of photographs of New Guinea to the Society, and these which he has now sent form an interesting supplement to them from an anthropological point of view. They are as follows:—

(1) Photograph showing tattooing of marriageable girls; (2, 4, and 5) Study of tattooing of maidens at Hood Point, Central Division; (3) Back view of tattooed girl.

Tibet and China. **Kozloff.**

Five Photographs of Tibet and China. Taken during Captain Kozloff's Expedition, 1899–1901. *Presented by Captain Kozloff.*

A short account of the important expedition during which these photographs were taken was given in the *Geographical Journal* for May last. The following is a list of the titles:—

(1) One of the gorges of the upper Mekong; (2) Captain Kozloff making astronomical observations while wintering in Kam, east Tibet; (3) Beggars at Kam; (4) Small town of Kuan-go-chen, never before visited by a European, in the Kan-su Province; (5) A Mongol of Tsaidam, who went with the expedition.

West Indies. **Wilson.**

Seven Photographs of St. Vincent. Taken after the eruption of May, 1902, by J. E. Wilson, Esq. *Presented by E. André, Esq.*

These photographs give a good idea of the havoc wrought by the recent volcanic eruption in St. Vincent.

(1) Between Lot 14 Estate and Orange hill, said to have been level and in cane cultivation, now gutted (top of Soufrière seen); (2) A height of 2000 feet below Soufrière, American scientists in the foreground; (3) Between Lot 14 Estate and Soufrière, once a forest, now a furnace (top of Soufrière seen); (4) Richmond sea-shore—quarter of a mile of land sank; (5) Richmond House, showing the gutted appearance of the land; (6) Richmond Great House, showing the wave-like appearance of the land—a family of nine supposed to be buried among the ruins; (7) Wallabon works, slight eruption taking place in the distance, four hundred dwellings have disappeared.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

ORDNANCE SURVEY MAPS.

The following is a list of the various Ordnance Survey Maps of the British Isles on sale to the public, together with the prices. E. Stanford, 12, 13 and 14, Long Acre, W.C., is the London agent; there are also provincial agents in most of the important towns of England, Scotland, and Ireland. In places where no agent exists, the maps can be obtained through the principal local post offices.

½-inch Scale.

	Price per sheet.	
	s.	*d.*
1. England and Wales, engraved in black, latitude and longitude marked, no hill shading or contours. Size 22½ × 15 inches. On paper . .	1	6
2.*England and Wales, engraved. Printed from a transfer from copper, hills in brown, roads sienna, water blue, woods green. Size 22½ × 15 inches. On paper	1	6
3.*Scotland, engraved. Printed from a transfer from copper, with water in blue, latitude and longitude marked, no hill shading or contours. Size 18 × 12 inches. On paper	1	0
4.*Scotland, engraved. Printed from a transfer from copper, hills in brown, roads sienna, water blue, woods green. Size 18 × 12 inches. On paper	1	0
5.*County and District Maps of Great Britain, cheap edition, roads in brown, latitude and longitude marked, on thin paper or folded in covers. In sheets. Unmounted . . . . *6d.* and	1	0
Folded in covers . . . . *9d.* and	1	0

1-inch Scale.

6. England and Wales, old series, in black, with outline and hill hachures. Size 36 × 24	2	6
Size 18 × 12	1	0
7. Ditto, new series, outline, contours in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
8.*Ditto, hills hachured in brown, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
9.*Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
10.*Ditto, hills hachured in brown, contours red, roads sienna, water blue, magnetic variation shown, latitude and longitude not marked. Size 18 × 12 inches. On linen-backed paper, either flat (with a few exceptions) or folded in covers. Single sheets	1	0
Combined sheets	1	6
11. Scotland, outline and contours in black, latitude and longitude marked. Size 24 × 18 inches. On paper	1	9
12.*Ditto, hills hachured in brown, and black contours, latitude and longitude marked. Size 24 × 18 inches. On paper	1	6
13. Ireland, outline, not contoured, in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0

14.*Ditto, outline, not contoured, in black, latitude and longitude marked, showing county, rural, urban, and county borough boundaries in red. Size 18 × 12 inches 1 0

15. Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper 1 0

16.*Ditto, hills hachured in brown, roads sienna, water blue, woods green, latitude and longitude marked. Size 18 × 12 inches. On linen, backed paper, either flat or folded in covers 1 0

17.*Combined maps of areas round certain large towns, or other areas, such as the New Forest and Lake District, and published in various forms and sizes. These maps usually show outline and contour in black and roads in brown. In sheets, unmounted . . . . . . *9d.* to 1 0

Folded in cover . . . . 1*s.* to 1 6

6-Inch Scale.

18. Great Britain, water coloured blue or back lined, contours in black, latitude and longitude marked.

Heliozincographed or photozincographed. Size 18 × 12 inches . . 1 0

Engraved or photozincographed (where not published in quarter sheets). Size 36 × 24 inches 2 6

19. Ireland, engraved or heliozincographed, contours in black, latitude and longitude not marked. Size 36 × 24 inches 2 6

$\frac{1}{2500}$ Scale.

20. Houses ruled in black, water blue or back lined, latitude and longitude not marked. Size 38 × 25½ inches 3 0

21. Houses red, water blue, roads brown, latitude and longitude not marked. Unrevised editions only coloured in this form. Size 38 × 25½ inches. From 2*s.* 6*d.* to 23*s.*, according to the amount of colouring. This form is gradually being superseded by 20.

Town Scales.

22. $\frac{1}{500}$ scale, houses stippled. Size 38 × 25½ 2 6

23. Ditto, houses ruled. Size 38 × 25½ 2 6

24. Ditto, houses red, water blue, roads brown. Size 38 × 25½ inches. From 2*s.* 6*d.* to 15*s.*, according to the amount of colouring. Applies to unrevised only.

25. 5-feet scale, houses stippled. Revised. Size 36 × 24 inches 2 6

Index Maps.

26. Indexes to the sheets of the 1-inch scale maps of England and Wales, Scotland, and Ireland, scale 30 miles to an inch. Sizes about 18 × 13 inches 0 2

27.*Index to the sheets of the 6-inch scale map, parishes coloured.

England and Wales. Size 18 × 12 inches 1 0

Scotland. Size 24 × 18 inches 1 9

28.*Index to the sheets of the 1 : 2500 scale map, parishes coloured.

England and Wales. Size 18 × 12 inches 1 0

Scotland. Size 24 × 18 inches 1 9

Nos. 27 and 28 are identical with Nos. 7 and 11, but with sheet lines added, printed on thin paper, and coloured to show civil parishes.

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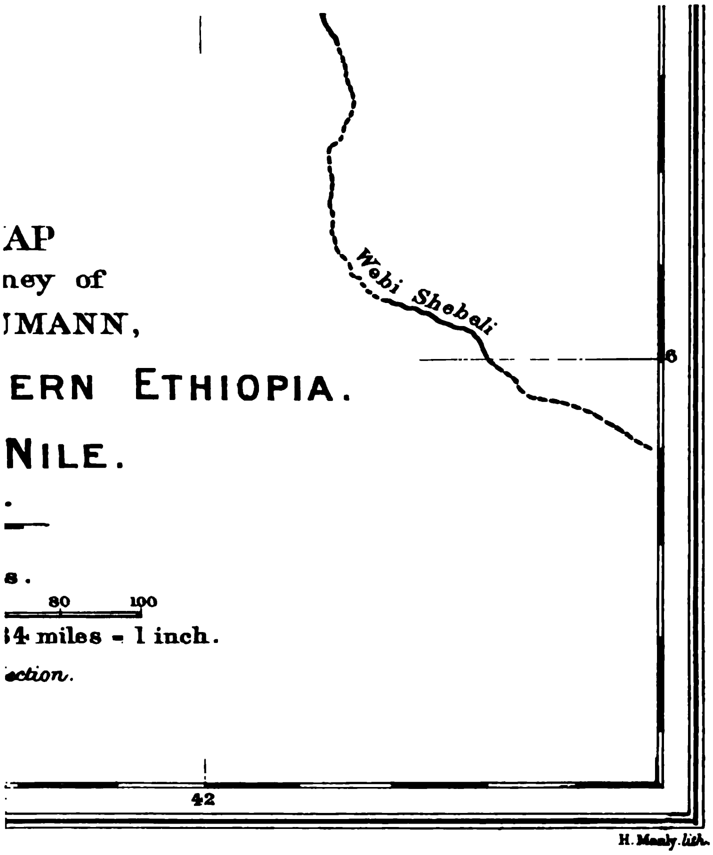
* Publication in progress.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The

Geographical Journal.

No. 5. NOVEMBER, 1902. Vol. XX.

ARCTIC PROBLEMS.*

By Sir CLEMENTS R. MARKHAM, K.C.B., F.R.S., President R.G.S.

The geographical system of the north polar regions has been gradually made known by piecing together the information brought home to us by a long succession of explorers. Forty years ago, when Sherard Osborn and I began to work for the renewal of arctic research, the discovery of the unknown coasts east and west of the northern end of the channel leading from Smith Sound appeared, from our point of view, to be the next piece of work to be done. The English Expedition of 1875 did this thoroughly for a distance of 300 miles. Every branch of science was enriched by its labours; and the character of the ice in the northern ocean was carefully studied. There is tremendous pressure on that coast; yet the small size of many of the floes, and the numerous hummocky ridges, showed that the ice was in motion during the summer. The expedition of 1875 did its work so exhaustively that there was nothing more to be done up Smith Sound, except the completion of the tracing of the north coast of Greenland. That great mass of land was known to be an island from a study of the tides in 1875–76, and the work done in the journey of Sir Lewis Beaumont has been continued by Lockwood and Peary. There, however, still remains a wide gap before the discovery is completed to Cape Bismarck on the east coast.

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* The map on p. 483 is little more than a rough diagram, intended to give an approximate idea of the ground covered by the expedition, and the position of the newly discovered lands.

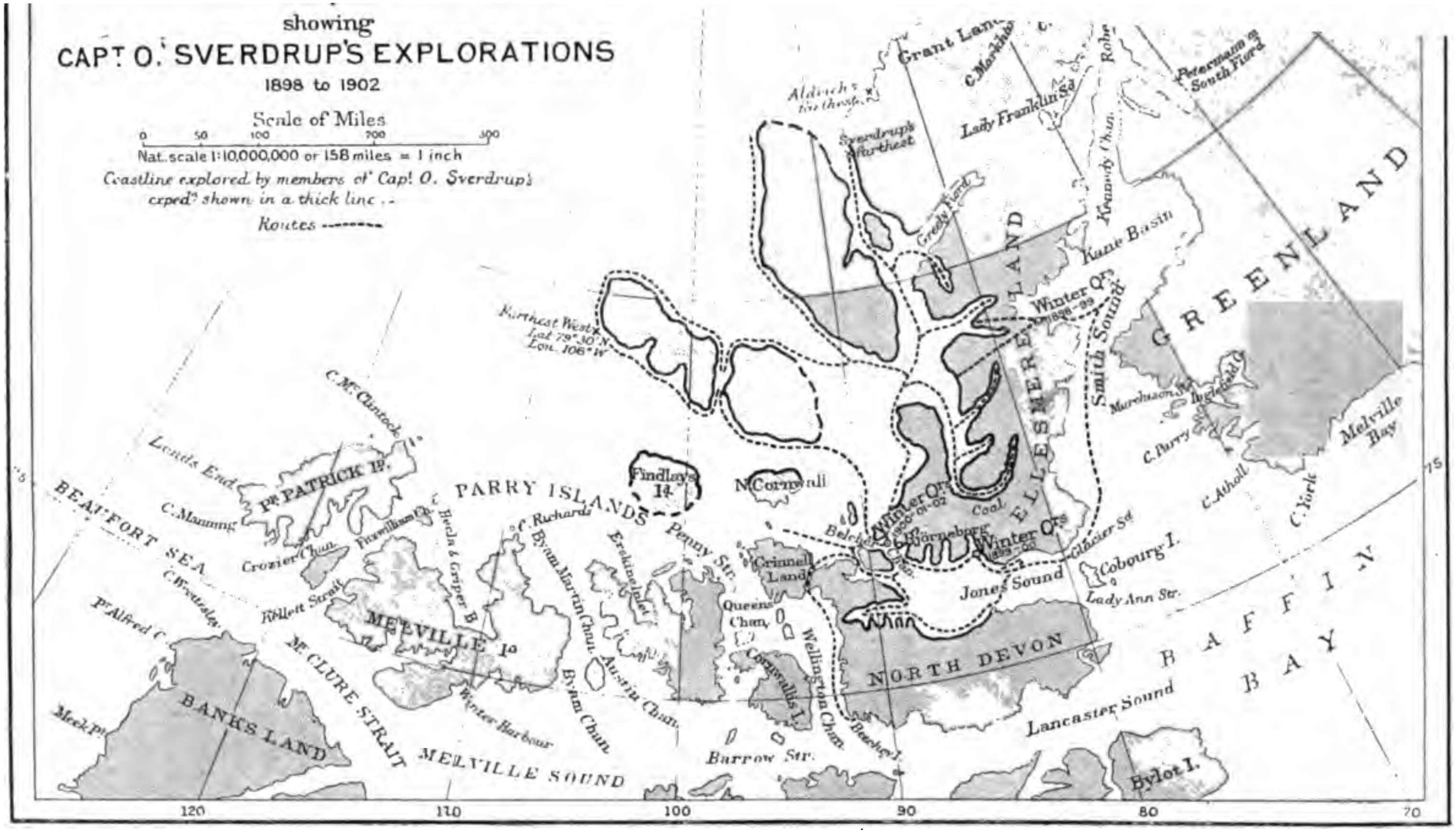
The expedition of 1875 threw a new light on the whole polar question. The extraordinary character of the floe-bergs and of the ancient ice on that northern coast, led us to compare it with the similar ice described by Collinson, McClure, and McClintock along the coasts of North America, Banks Island, and Prince Patrick Island. It seemed to indicate continuous ice-pressure along the western side of the Arctic Regions from Bering Strait to the east coast of Greenland, and a consequent flow over a great ocean from the eastern to the western side. There were, however, several gaps to be filled up and many researches to be made before the full meaning of the knowledge then in our possession could be explained.

In my note on the results of the Arctic Expedition of 1875, written in the following year, I had already come to the conclusion that there was a deep sea, and not land, to the north of Franz Josef Land; that there was a continuous drift across the Arctic Regions from east to west, and, consequently, heavy ice-pressure on the western side.

All this was confirmed by Nansen in his great discovery of the polar ocean. After his voyage there is no longer any geographical object in going to the north pole, except for the sake of deep-sea soundings, for it is merely a point in the polar ocean, the economy of which has been made known by Nansen. That great explorer finally removed the veil which concealed the secret of the Arctic Regions. There is no insuperable difficulty in reaching the pole with an able leader and a proper system. It is not to be compared to the work of McClintock and Mecham; but there is no sufficient object.

The really useful work that remained, so as to connect the whole western side of the arctic regions, is (1) the discovery of the region between the Asiatic Coast and Prince Patrick Island; (2) the examination of the space from Prince Patrick Island to the furthest point reached by Admiral Aldrich during the expedition of 1875; and (3) the completion of the tracing of the northern coast of Greenland.

The first piece of work is the most difficult, and it may well be that the region in question contains no land, and is merely part of the polar ocean. The third would be a great and important achievement. Captain Sverdrup intended to attempt it by wintering in a hut on the north coast of Greenland, and sending the *Fram* round to meet him at Cape Bismarck. This is the only way in which it can be done; but two ships would be safer. Prevented by the unfavourable season in 1899, Captain Sverdrup fortunately turned his attention to Jones Sound, which led to the completion of the most important remaining



showing

CAPT. O. SVERDRUP'S EXPLORATIONS

1898 to 1902

Scale of Miles

Nat. scale 1:10,000,000 or 158 miles = 1 inch

Coastline explored by members of Capt. O. Sverdrup's exped.ⁿ shown in a thick line . .

Routes --------

arctic work of all, namely, the discovery of what was hitherto unknown in the wide gap between Prince Patrick Island and Aldrich's furthest.

The whole of the northern coasts of the Parry Islands were discovered by the naval officers employed on the Franklin searches, from Jones Sound to Prince Patrick Island. But, except at the western extreme of these discoveries, the ice-pressure was not very great, and it was supposed that there must be land further north. Indeed, at the eastern end Sir E. Belcher sighted land far to the north, which he named North Cornwall; and from Bathurst Island land was sighted to the north, and named Findlay. Aldrich's furthest is some 250 miles to the north of Belcher's discoveries. The great arctic work to be done, by way of Jones Sound, was to decide these questions, to discover the western side of Ellesmere Island, and to discover the land, if it existed, to the north of the Parry Islands. In this way our knowledge of the long line of coasts facing the frozen ocean on the west side of the Arctic Regions would be made complete.

This great work has been done by Captain Sverdrup and his gallant companions during four travelling seasons entailing four arctic winters, and it has been done thoroughly. They have discovered the western side of Ellesmere Island and its intricate system of fiords, as well as three large islands west of Ellesmere Island; they have explored the northern coast of North Devon; they have connected Belcher's work with the coasts of Jones Sound; they have reached a point within 60 miles of Aldrich's furthest; and they have discovered that land north of the Parry Islands the existence of which was conjectured, as far west as the longitude of the eastern coast of Melville Island. This includes the discovery of the northern sides of North Cornwall and Findlay Island. In addition to the main arctic problem which is thus solved, it is likely that the region discovered will be of exceptional interest, from the winds and currents, the varying character of the ice, the existence of coal-beds, and the abundance of animal-life. A systematic survey has been made of these important discoveries, checked by astronomical observations. We must look forward to an account of these things, and to the details of the expedition, with the deepest interest; and meanwhile we may well express admiration for the way in which the work was conceived and executed, and at the perfect harmony with which all loyally worked under their chief. Without such harmonious work success was not possible.

THE UPPER CONGO AS A WATERWAY.*

By the Rev. GEORGE GRENFELL, B.M.S.

UNTIL a quarter of a century ago people little dreamed of the existence of the great Central African waterway which now furnishes a practicable route half across the continent; and when Mr. Stanley (now Sir Henry M. Stanley) discovered this magnificent natural canal of 1000 miles in length, he little thought that the affluents flowing into it from the north and from the east and from the south would increase the available waterway to beyond 6000 miles. Neither could he, nor those who were so interested in his great discovery, have ventured to imagine that by the end of the century that had already entered upon its last quarter, more than a hundred steamers would have been launched upon those waters in the interests of commerce and civilization.

The cataracts that bar the navigation of the Congo at a point 100 miles up-stream from the coast, and that are more or less continuous for some 200 miles, have sufficed from the days of Diogo Cão right down to our own times, to daunt every explorer who from the Atlantic has tried to solve the mystery of the upper river, and it was only to the intrepid traveller from the Indian ocean that it at length yielded up its secret. Even the navigable lower river, accessible though it was from the sea, was but little known, and was practically unused as a route to the interior, the greater portion of the upper Congo trade finding its way to the coast by the long overland route to Loango, Ambriz, and St. Paul de Loanda. So late as 1874, when Lieut. Grandy started eastward in search of Dr. Livingstone, he left the coast at a point some distance south of the mouth of the river, and struck away inland without utilizing the waterway.

Till 1879, two years after Stanley's discovery was made known, steamers rarely made their way up the lower Congo beyond Boma, and then, with the exception of a small gunboat at long intervals, these were all coasters of but light tonnage. In fact, sometimes for periods of three months together, Boma would be entirely dependent upon canoes and small sailing craft for its communication with the coast. In no case, however, did these small steamers go beyond Noki; but to-day it is by no means unusual to see four ocean liners, ranging up to five thousand tons, at Matadi, the port at the foot of the cataracts whence the railway sets out on its track to Stanley pool, and after some 220 miles reaches the smooth water of the upper river. Matadi is at the farthest limit of navigation on the lower river, some 8 miles beyond Noki, and, instead of being the bare rock it was a few years ago, is now, after much blasting, the site of one of the most important ports on the west coast of Africa.

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* Notes to accompany the Rev. George Grenfell's map of the Congo river. Map, p. 572. Three sheets of the map are given in the present number; the other two sheets will accompany the December *Journal.*

At the other end of the railway, where, after rounding the cataracts, it reaches the navigable upper river, is the port of Leopoldville, the next most important place in the Congo State to the capital at Boma. Brazzaville, the administrative centre of the French on the upper Congo, is on the other side of the river about 3 miles away. These places were unknown native villages twenty-five years ago, but since that time have witnessed great developments, and have become the starting-points for a fleet of more than a hundred steamers that have been carried in plates and sections beyond the cataracts, and reconstructed there. These steamers are of all sizes, from small open launches up to crafts carrying between 200 and 300 tons.

STEAMERS ON THE UPPER CONGO.

The first steamer to reach the great Central African waterway was the *En Avant*, a small paddle-boat 43 feet long and 8 feet in the beam. It was carried up in three sections on waggons, and reached Leopoldville in November, 1881, after a couple of years of very arduous labour on the part of Mr. Stanley and his lieutenant, and the continuous employment of several hundred carriers and workmen.

The next steamer to arrive came a year later. It was a 30-feet mahogany launch, and was carried up on a single waggon. It had seen service as a tender to one of King Leopold's yachts, and was placed at Mr. Stanley's service by his Majesty—a beautiful little craft, but one that proved too frail for the trying conditions of upper Congo service.

This was followed by the French steamer *Ballay*, a steel launch larger than the mahogany one just referred to, but smaller than the *En Avant*. It was brought by way of the Ogowe, and after steaming as far as possible up that river, its boilers and engines were dismounted, and its empty hull hauled through the shallower waters of the upper reaches. Later, when it could be no longer borne by the waters of the Ogowe, it was dragged across the narrow watershed dividing that river from the Alima. The waters of the Alima being reached, the hull was refloated, and, deeper water being gained, the machinery was replaced, enabling her, under steam, to reach the main stream of the Congo at a point some 250 miles above the cataracts, and about 550 miles from the coast.

The labour involved in the transport of each of these three steamers was so great, that when the fourth was decided upon, it was arranged to send out the prepared materials, plates, and parts of machinery, and to put them together at Stanley pool, where the upper navigable river commences. The experiment was an eminently successful one, and it was proved that a great deal more was gained by transporting a steamer in small pieces, such as could be carried on men's shoulders, than was involved by the cost of reconstruction. This steamer, the *Association Internationale Africaine* (named after the organization under whose auspices it was sent out), was about the size of the *En Avant*, but had a screw propeller instead of paddles; it was completed early in 1883.

The next boat to be launched on the Congo was the *Peace*, sent out by the Baptist Missionary Society of Great Britain. Designs were prepared for her early in 1882, but it was not till December that she was ready for shipment. Transport and reconstruction occupied just a year and a half, and allowed of her being launched in June of 1884. In this case the idea of subdivision was carried out so thoroughly by Messrs. Thornycroft, the builders, that no single piece of the hull, or boiler, or machinery was of greater weight than the tusks of ivory the native carriers were accustomed to carry from the interior down to the coast. She was a twin screw boat, 70 feet long and 10 feet 6 inches wide, drawing only a foot of water, and was the first craft to which the since famous Thornycroft tubulous boiler was fitted. She is still running, and rendering very efficient service.

During the first two years after being launched she carried those in charge of her along 2000 miles of the upper Congo affluents, previously unvisited by any white man, and it was during this time that the preliminary lines of the map of the main stream now published were laid down. The details of the islands, and of the many channels, have since been filled in as opportunity has offered during a succession of journeys up and down river.

While the *Peace* was being reconstructed at Stanley Pool, the Belgian Association was engaged in the task of transporting the first stern-wheel steamer, *Le Stanley*, to the upper river. She was a boat 80 feet long by 16 feet beam, built by Yarrow on their widely adopted system of floatable sections, a system that allows of the structure being bolted together as its various sections float on the surface of the water, and the steamer to be completed without the help of a slipway or a dock. The separate sections of this craft were 16 feet by 10 feet by 4 feet deep, and each one had its own iron-wheeled waggon. The difficulties encountered in hauling these waggons over the hills were so great that, although during the following fourteen years some forty more steamers were carried round the cataracts, this system was not again resorted to till the railway made the transport of heavy sections a simple matter. Only one departure from the plan of sending up prepared and fitted plates was resorted to, and this was in the case of the *Ville de Bruxelles*, a pitchpine boat, 80 feet by 18 feet, which was sent up in the shape of planks and timbers. In this case the cost of transport was also very heavy, and the durability of wood proved to be so far inferior to that of steel plates as hardly to enter into competition therewith. The experience gained in the case of the mahogany boat, and later with this pitchpine one, was clearly against building with wood. By this time, also, experience was just as clearly in favour of stern-wheels as propellers. Stern-wheels, however, are heavy, and involve heavy machinery difficult and costly to transport, and only the Government and the larger commercial enterprises could face the problem of organizing the needful caravans for anything but a comparatively small boat of this type. The Congo Inland Mission managed to get their 70-feet boat through in 1884; but one of the American missions, after spending a considerable sum in carrying a larger boat part of the way round the cataracts, had to abandon the task, and to pay a further considerable sum to have it carried back to the foot of the cataracts. Here this boat was eventually reconstructed and sold, and it has since remained on the lower river.

Since the completion of the railway in 1898, the upper Congo fleet has been more than doubled in number, and has been increased to several times its previous capacity. Till the railway provided for the transport of heavy machinery, steamers were practically limited to a maximum capacity of 60 tons. With the help of the railway, steamers of 200 to 300 tons have been launched at Leopoldville, and this without a tithe of the effort and stress previously involved by the transport of a steamer one-fifth the size.

The stern-wheel system has simplicity and ready access to machinery as prominent advantages, though it is not so economical as the ordinary screw-propeller. The smaller boats are also inclined to be top-heavy, and small and large alike have as little of the "ship-shape" about them as any floating craft can well possess—a 2-lb. biscuit tin with a long funnel at one end and a sort of water-wheel at the other would make a model doing but little injustice to the majority of Congo stern-wheelers.

The Government is trying experiments with a series of lighters of from 70 to 300 tons, and powerful tug-boats capable of towing them at moderate speed; but up to the present opinion is somewhat divided as to the advantages of the system. Theoretically there is much in favour of it, but the difficulties of navigation caused by currents and counter-currents of the narrower reaches of the river are greatly increased when the power and the load are in separate vessels.

The reconstruction of steamers and boats sent out in comparatively large sections, as so many have been since the completion of the railway, is a much simpler task than when plates have to be riveted together one by one, and the structure gradually built up. It has the disadvantage, however, of involving much heavier cost for ocean freight, and of not being so strong, for the joints between the sections are continuous lines from keel to deck, across the deck, and down to the keel again, whereas in the case of plates the joints are "lapped" like those in the boarding of a well-laid floor. The disadvantage in this latter respect was strongly emphasized last year during a trial trip by the giving way of one of these long lines of joints, and the termination of the steamer's career. As I came down river last time I saw her upper works just above water, some 2 miles or so out of the dock where she had been put together.

Considering the many risks encountered by steamers on the upper Congo and its affluents, the list of total losses is not so great as one might expect. The losses would have been much greater but for the careful way in which most of the boats are subdivided into watertight compartments. These subdivisions are not only important as confining the area to which water is admitted in case of a plate being "stove in," but because they greatly stiffen the long shallow hulls, and enable them to stand the severe and variable stresses consequent upon the unequal distribution of load on the structure generally. These "stresses" in the case of stern-wheelers are peculiarly severe, seeing the heavy boiler is at one end and the machinery at the other, and just where, in each case, the buoyancy is least. To counteract the tendency in these boats to rise amidship and to drop at the bow and stern, posts and tie-rods are introduced in all but the smaller ones; but notwithstanding these measures, it is very unusual to see a stern-wheel steamer that preserves her original lines for more than the first few months of service. However, though many of the Congo steamers are only built of very light plate and become more or less hump-backed, they are so tied and braced together that they carry their heavy loads wonderfully well. It is no unusual thing to see them laden till they have less than a foot of freeboard, and, in places where the river is rough, to see the water rolling pretty continuously across the decks. Where hatches are well fastened down this is not a very serious contingency perhaps, but, caught in bad places, two 10-ton boats with large deck-openings filled and went down in deep water. Two other steamers of nearly the same size have also been totally lost by having been carried over cataracts. The strong currents setting off projecting reefs, and the counter-currents and whirlpools forming below them, have been responsible for the loss of two 20-ton stern-wheelers. This class of boat, if it carries any considerable structure on the awning above the main deck, is peculiarly liable to top-heaviness. In both the cases now referred to the steamers capsized, and, after floating down stream a short distance, finally disappeared in deep water.

Dangers of Navigation.

Long reefs of rocks jutting out into the stream, and sometimes occurring as isolated patches in the middle of the river, render the first 150 miles or so of the upper Congo beyond Leopoldville particularly dangerous. They have so far, however, caused but two total losses, though they have involved very heavy expenditure for repairs to many boats. Reefs jutting out from the bank are generally indicated by their shoreward ends presenting themselves to view, and by the ripple they cause upon the surface of the water; but isolated reefs and rocks are sometimes found in the quiet places below projecting points, where there is no current at all, or perhaps a slight counter-current, and these are the most dangerous of all the obstacles to Congo navigation. A 40-ton steamer was wrecked on one of these projecting reefs, but her cargo and much of her machinery was saved; and the *Courbet*, sister craft of the *Faidherbe* that was carried across the watershed dividing the Congo from the Nile to figure in the "Fashoda affair," was lost by striking one of these isolated masses of rock in comparatively still water. She struck it with sufficient force to tear open several plates and to pass over into deep water beyond, where, some four or five minutes later, she sank, as the *Victoria* sank, bow first, and her propeller still revolving in the air as her stern disappeared from view.

Next to the rocks in importance among the dangers of Congo navigation one must rank the "snags." They cause as many accidents as the rocks, but happily not such serious ones. As the Congo and its affluents with their more than four thousand islands furnish at least 20,000 miles of overhanging wooded banks, the number of trees which fall annually into the water is very considerable. Many of these are of greater specific gravity than water, and lie just where they fall; the lighter ones float for awhile, but becoming waterlogged they sink to the bottom. Those that sink in deep water are no menace, but those that lie where during the fall of the river they come within a few feet of the surface are a constant source of danger.

Steamers drawing more than 3 feet of water incur greatly increased risks, because snags and rocks below that depth give little or no evidence on the surface of their existence below. During the low-water season steamers drawing more than 4 feet of water are navigated with considerable difficulty, by reason of the innumerable sandbanks which encumber the channels. This is especially the case on downward journeys, much time being frequently lost in pushing or in warping off. If the steamer draws 3 feet or so, the crew can generally solve the difficulty in a little while by jumping into the water and pushing in the required direction, two or three of them being occupied the meanwhile in searching for deeper water, and, having found it, they form into a line of living buoys, indicating the best route across a shallow patch. If mere pushing is not enough, the anchors of shallow boats can easily be carried out into 4 or 5 feet of water and the winch be brought into requisition for the work of warping off. But when the boat draws 4 feet or more, anchors have to be carried out by means of boats or canoes, and warping off becomes an especially wearisome operation. Stern-wheelers can cope much more speedily with the difficulties furnished by sandbanks than is the case with screw-propellers. If a stern-wheeler sits down on a sandbank, it is mostly a matter of keeping the engines going astern for a time, and the violent wash caused by the paddles will excavate a channel; the screw-propeller, on the other hand, simply excavates a deep hole immediately under the stern, while at the same time it drives a lot of sand into the stern tube bushings, and grinds the shaft and bearings away in a fashion that is simply terrible from the engineers' point of view.

The reason why down-stream journeys are more seriously delayed by sandbanks than those in the opposite direction is due to the fact that the banks gradually shelve upwards till their highest ridges are reached at the down-stream ends, and steamers, after being driven up the sloping bank a certain distance by virtue of their own speed, are driven on still further by the force of the descending current. On the other hand, a steamer going up-stream strikes a sandbank with its own proper force reduced by that of the current instead of increased thereby, and, as a sandbank generally presents a steep face on its down-stream side, the steamer either cuts through the crest or is pulled up sharp before it is seriously embedded.

Upon regarding a map of the Congo between the 15th and 25th meridians, one remarks that the river follows a course indicated by wide curves and comparatively right lines that contrast very markedly with the serpentine courses of so many rivers. However, if the banks of the river are not traced in the characteristic sharp curves of inland waters, the main volume of the river and the strong currents undoubtedly follow very sinuous lines. Where the river-banks are comparatively close, say from $\frac{3}{4}$ mile to $1\frac{1}{4}$ mile apart, the water setting over from one side to the other creates below the point of deflection a counter-current, where banks of sand and mud are deposited, and, upon impinging upon the other side, the water is again deflected and another counter-current set up, to be followed by the formation of other banks. Thus the course of the main volume of water is very tortuous, though, except at very low water, when the banks show above the surface, the fact is apparent only to those who are personally interested in navigating its course. Where the river widens out, as it does in many places, to more than 5 miles, and even to 6 or 7, and where it winds its way among islands and round sand-banks, the waters, instead of maintaining themselves at a depth of several fathoms, are reduced to as many feet or even less. Spread over so wide an area, they become sluggish, and much of the sand with which they have been charged, picked up in the higher reaches by the swifter stream, is deposited in the shape of a long series of fan-tail banks, over the extended edges of which the water glides with its very characteristic ripple into the suddenly deepened channel on the down-stream side, and this, in many cases, without affording a passage for even a shallow-draught steamer. If such a bank is to be passed at all, it is at the extremity on the opposite side from which its formation commenced, but very often the deeper water to be looked for between the point of the sandbank and the shore is so narrow or is so overhung by trees as to be impracticable, and then another channel has to be sought among the islands. As there are nearly eighty islands between 5 and 10 miles in length, and fifty more than 10 miles (one is nearly 50 and two are more than 30 miles long), getting out of one channel into another is sometimes a serious contingency involving a long *détour.*

NAVIGATION OF THE CONGO.

The navigable upper Congo commences at Leopoldville, situated at the head of the cataracts, and at the point where the railway round the cataracts has its terminus. From Leopoldville to Stanleyville, at the foot of the Stanley falls, a distance of 980 miles, navigation is uninterrupted all the year round. The government wharf and the railway terminus are within 200 or 300 yards of the ledge of rocks over which the river makes the first of a long series of drops on its way to Matadi, a series with a total of 700 feet.

On leaving Leopoldville and proceeding up-stream, one has the French Congo on the left hand for a distance of 330 miles, as far as the confluence of the Mobangi, along the course of which stream the boundary turns northward. From this point the Congo Independent State holds both banks of the main stream.

Brazzaville, the capital of the French Congo, is about 4 miles beyond Leopoldville and the cataracts, and, of course, is on the other side of the river. The entrance to Stanley pool is about 3 miles beyond Leopoldville, and the river thus far is from 1 to 1¼ mile in width. On the Brazzaville side the cliffs are 100 feet or more in height; on the Congo state side the banks are not so bold, but are even more rocky. As, besides the rocks on either side, there are several detached reefs right out in the stream, navigation is very dangerous—so dangerous, in fact, that from time to time the question of making a new port some 6 or 7 miles beyond has been seriously entertained. At Kalina point the full force of the Congo is encountered, and rounding it into Stanley pool is often a difficult matter. The downward current, as it rushes out of the pool, sets off the point with such force as to make a strong up-current for a quarter of a mile below on the landward side. Taking advantage of this current on going up-stream is always fraught with the risk of being swept completely round as one enters the down current, unless the matter is negotiated in the most careful manner. Captains always breathe more freely when Kalina point is behind them.

Stanley pool is an expanse of water and islands and sandbanks some 20 miles in length by 14 miles in breadth, but though Kalina point has been passed on entering it, the difficulties of navigation are not at an end; the south-west corner of the pool bristles with rocks till Kinshasha is well astern. Then, as soon as the rocks are passed, one is in the midst of the difficulties furnished by the sandbanks deposited by the river as it spreads itself out and becomes too sluggish to hold the sand any longer in suspension. The difficulties presented by sandbanks would not be so great if, like the rocks, they but stayed in the places where one found them. The channel of this season may be dry bank the next, and soon be covered with grass and scrub, but only perhaps to disappear a little later at the rate of some hundreds of cubic yards per minute as it is undermined by the current, which has once more been deflected towards its previous course. Sometimes a disappearing sandbank, while it goes to build up an obstacle at some other point, leaves a positive danger in the shape of a reef of rocks which it had previously very effectively masked.

Beyond the pool the channel for 125 miles is confined between steep-faced hills on either side. From bank to bank the distance ranges from 1 to 2 miles; it is frequently less than 1 mile, very seldom as much as 2. The hills rise to 800 feet above the river for some distance from the pool, but at 100 miles beyond they are seldom much more than half that height, are much less steep, and begin to recede from the water's edge. The height of the river above the sea is a little more than 800 feet. For the first 30 miles the course is eastward; then, after passing the Black river, it turns sharply to the north. At a point 85 miles beyond the pool the Kasai joins the Congo, pouring its immense volume into it at a right angle through a deeply cut chasm in the rocky hills some 700 yards in width. Through this gap in the hills steamers have access to the series of waterways furnished by the Kasai and its tributaries, amounting to not less than 1500 miles. When the Kasai is in flood its current in the centre is from 5 to 6 miles an hour, and it brings down such an amount of bright brick-red water as to greatly modify the dark brown of the stream which gradually absorbs it.

About 40 miles north of Kwa mouth (the Kasai confluence), the "Chenal," as it is called, terminates; the hills have so receded that the river spreads itself out to a width of 5 miles, the rocky ledges and reefs, the spurs sent out into the river by the hills on both sides, and that have been a continual menace since leaving the pool, have given place to sandbanks, and rocks are hardly seen again for 500 miles. This expansion continues northwards for 30 miles; it is very shallow, and its farther end is characterized by many islands. On the slightly rising ground at its northern extremity, the Bolobo villages are found, and just beyond, after narrowing to less than 2 miles, the channel expands again to a width of 5 or 6 miles—the width it practically maintains as far as Lukolela, a distance of 100 miles. Midway along this reach the Alima pours its water into the Congo from the west, and the delta it forms extends itself into the main stream till the width becomes a little less than 4 miles. It is at this point alone, throughout the length of this reach, that both banks of the river are in sight of each other, the long lines of islands elsewhere obscuring the view. On the same side of the river, and some 30 miles beyond the Alima, is the principal mouth of the Sanga, a very important tributary that furnishes an available waterway for steamers right up to the south-eastern corner of the German Cameroons colony.

The Lukolela narrows are some 5 miles in length, and are formed by a range of low hills of ferruginous conglomerate, running north and south, through which the river makes its way. Twenty miles beyond, and after widening out again to 5 miles, there are more narrows and more ferruginous conglomerate, though it does not rise more than 30 or 40 feet above the river. Beyond the Butunu narrows, the river widens to 7 miles, but in less than 25 miles the conglomerate upon which Liranga and Ngombe are built reduce the river once more to less than a couple of miles. Liranga is at the south-western limit of the delta formed by the confluence of the Mobangi with the main stream, and from this point the French boundary trends northwards, following the "thalweg" of the Mobangi instead of that of the Congo. The Mobangi is navigable as far as Zongo, a distance of 350 miles, and there are several important reaches beyond that are available for the small steamers taken beyond the various rocky barriers at propitious moments of the river's flood. It was by this river and its affluent the Mbomu that the *Faidherbe* made its way, to be eventually carried across into the Bahr el Ghazal province. It is by this river, also, that the French expeditions towards Lake Chad find their most advantageous route from the south.

Beyond the Liranga-Ngombe narrows there are 170 miles of the Congo's course before, at a point just below Bangala, it is reduced to 2½ miles from bank to bank. So persistently do the islands block the view, that throughout the whole length of this long reach there are very few places where one bank is observable from the other. The Juapa, the Ikelemba, and the Lulongo rivers pour their inky waters into this reach within the first 40 miles north of the equator, and, after commingling with the Congo, very perceptibly darkens its hue. These important eastern tributaries furnish more than 1000 miles of navigable waterway, but they mostly traverse very low-lying country.

Between the Bangala narrows and Bopoto, where once more the river is perceptibly reduced in width, there is a distance of 175 miles. Where this reach includes the 50-mile island of Nsumba, the river widens to 9 miles. The only important tributary received in this reach is the Mongala, from the north-east, a river navigable for more than 300 miles, and traversing one of the best rubber-producing fields of the Congo State. Bopoto is situated almost at the extreme north of the great "Horseshoe bend" (in 2° 7' N. lat.), and on the flank of the first semblance of a hill for more than 400 miles after passing Lukolela.

After so long a stretch of low flat land, it is quite refreshing to see a hill, even though it is barely 200 feet in height; to the natives who have not previously seen anything bigger than an anthill, such an altitude is quite impressive, and to the younger people even awe-inspiring. Here one comes into contact with the felspathic bed rock of the central part of the continent, and for 10 miles or so navigation becomes a very serious matter because of the dangers incident upon the presence of reefs. It is the same rock over which the Congo drops at Stanley falls, and over which it drops again below Stanley pool.

The next narrows are 100 miles beyond Bopoto, and about 10 miles above the mouth of the Loika, or Itimbiri river; apparently they are caused by the deposits brought down by that river. The Loika is navigable by steamers for 150 miles, as far as the Lubi falls, and is the route by which the Congo Government transport leave the Congo for the Lado enclave on the Nile.

At a distance of 105 miles beyond the Lubi narrows, and just beyond the mouth of the Aruwimi, the Congo is reduced to a mile in width, and beyond that point largely loses its lacustrine characteristics. A change announces itself on the southern bank some 30 miles before reaching Basoko (the centre of administration at the mouth of the Aruwimi river), by the reappearance of rocks and of low hills, and by the time one is opposite Basoko the hills have become pretty continuous, and rise to nearly 200 feet in height. On the north bank, the high land does not commence till one is 15 miles east of the Aruwimi, beyond that point it is nearly continuous till Stanley falls are reached. On the southern bank, however, the hills soon give place to a narrow ridge of clay and gravel bank slightly above flood-level, with a wide extent of swampy land to the interior. The distance between Basoko and Stanley falls is 130 miles, but at a point a little less than halfway, the Lomami, coming from the south, empties into the Congo the waters it has gathered along a course of more than 700 miles; it is navigable for more than 200 miles. If the Congo is markedly less in size above the Aruwimi, it is even more markedly reduced beyond the point where it receives the Lomami, and the islands become very few. At 20 miles beyond the Lomami the channel is once more bounded by steep and often rocky banks of from half a mile to a mile apart. During the low-water season the navigation of the last 20 miles below Stanleyville becomes somewhat dangerous, because of the reefs of rocks that at that time lie so close to the surface. Boats drawing more than 3 feet of water find this part of the river impracticable during the dead low water that sometimes obtains at the autumnal equinox, but happily this only lasts for a week or two, and at all other times boats drawing from 4 to 4½ feet can, with caution, navigate the whole of the 980 miles from the pool to the falls.

FLOOD SEASONS.

On the upper Congo each year is characterized by two flood seasons, May and November, prolonged respectively in some places till June and December. The maximum rise in the upper reaches towards Stanley falls is about 8 feet at both these dates. At Stanley pool the rise in May is not so great, but in November and December it is nearly twice as much.

In January and February the water is falling everywhere over the Congo system. The Mobangi has commenced to fall in October, and by this time is near its minimum. At Stanleyville the water commences to fall early in December, but at Stanley pool the maximum is at times not reached till the close of the month. During the month of January the fall is very rapid, and by the end of the month the river is very low. In April there is a very general rise, and the Loika and the Aruwimi approach their high-water marks. By May the Congo waters are so much higher than those of the Mobangi that there is a flow of Congo water into the Mobangi through the Ibenga channel and flowing northwards to 24′ 30″ south of the equator. The same thing occurs in the Ekenzi and Bwaiya channels communicating with the Sanga; they serve, according to the relative heights of the waters of the Sanga and the Congo, as outlets or inlets.

As there are two high-water seasons, so also are there two seasons of low water, the second occurring in August and September; and at some points these are the months of the lowest water of all the year. Along the farther half of the upper river the rising and falling of the water is more capricious than further down stream, changes of 2 or 3 feet occurring in a day or so without persisting. At Bolobo and the pool the rising and falling are most regular; the rise seldom exceeds 2 inches per day, and the fall is rarely more than 3 inches in a similar period. This greater regularity is doubtless due to the fact that the inundated plains, thousands of square miles in extent, which are under water every season, act as storage reservoirs, as Lake Ntumba also does, alternately taking and giving the water as the river rises and falls.

VELOCITY OF CURRENT.

The rate at which the Congo current flows varies very considerably; it seems to depend somewhat upon the height of the river, and to be modified also by the contour of the channel. Generally speaking, the current is faster as one approaches the higher reaches. The fastest currents registered, except at points where exceptionally accelerated, have been in the neighbourhood of Basoko and beyond, and they have ranged from 300 to 350 feet per minute. Near Bopoto, according to season and location, the current ranges from 225 to 270 feet per minute; lower down river the mean may be taken as 200 feet per minute.

Some of the affluents flow at a slower rate, and range from a speed of from 70 to 170 feet. At the point where the Kasai pours through its narrowed channel into the Congo, the current is not less than from 600 to 700 feet per minute at the time of flood—about the same rate as that of the Congo itself as it flows out of the pool round Kalina point.

FUEL FOR STEAMERS.

Seeing that railway freight round the cataracts is nearly £40 (forty pounds) per ton, the importation of coal as fuel for steamers is practically impossible. Fortunately, lack of wood, which so hampers steam navigation on the Nile, is unknown on the Congo, as, in the main, the banks of the river and the islands are forested throughout the whole course from Leopoldville to Stanleyville. True, in some reaches there are stretches of grassy foreshore before the forest is accessible, and in some places the forest is very swampy, but it is very seldom indeed that wood is not within reach. Sometimes during the high-water season it has been needful for wood-cutters to work in 2 or 3 feet of water, and even, in places where no foothold could be secured, for them to go out in boats so that they might reach and climb the trees for the purpose of lopping off their branches, after having made fast the ropes by which they were to be drawn on board the steamer for fuel. The increased consumption of wood, by reason of the recent additions to the upper Congo fleet, has made dry wood scarce in some places, but as yet very little cutting of live timber has been needful to keep up the requisite supply of fuel, and the forests are so prolific that even though they had to be thinned out to meet the supply, the thinning could be so arranged as to be of advantage to the timber growth rather than otherwise. So far the dead trees of the forest have met nearly all the demands, and the annual supply of such fuel is immense.

FOOD SUPPLIES.

The matter of food-supply is not less important than that of fuel. The difficulty in obtaining food from the natives is hardly credible to those who regard the Congo banks as populous and fertile; if they were more populous they could easily be made productive. As things are at present, steamers going down to the Pool have to shorten their stay to the fewest possible days on account of the difficulty experienced in feeding their crews, and after leaving the Pool, nothing or next to nothing is to be obtained for the first 180 miles. The great lack is that of people to cultivate the ground. After carefully counting the houses in the villages on the banks of the river, and allowing a very full average for the inhabitants of each house, it is perfectly clear that there are not more than 125,000 people in the villages and towns along the 980 miles of waterway. The great necessity of the Congo, as of all African colonies, is people for its development. We know there are many places in the Congo State where the population is much more dense than on the river-banks, but nowhere else are people of such advantage to the Government or to commerce as they would be if settled on the banks of the great central waterway of the continent. A policy which made the river-banks to be more desired by the people than the interior, would best serve the interests of the State, and would help forward at a greatly quickened pace the opening up and civilization of the country.

THE GEOGRAPHICAL DISTRIBUTION OF VEGETATION IN SOUTH GEORGIA.

By C. SKOTTSBERG, Botanist of the Swedish Antarctic Expedition, 1901-1903.

On April 22, 1902, the Swedish Antarctic Expedition on board the *Antarctic* arrived at South Georgia in order to make an investigation of its natural history. After a visit to the location of the German Expedition in 1882–83, we put up our tents in Cumberland bay, and there I spent nearly two weeks. During this time the land was almost free from snow, so that I was able to investigate the country in spite of the advanced season. From May 17 until June 15 the vessel was anchored in another part of the above-mentioned bay.

Before the German explorers undertook their very extensive examination of South Georgia, our knowledge of that island was very scanty. From the Germans we obtained very full information of the conditions at Royal bay.* The neighbourhood of Cumberland bay was superior to the German location, both as to the extent and the variation of the ground, and it was hoped that our researches might yield results that would supplement what we hitherto knew. In the following paper I give a short summary of the features and the vegetation of South Georgia, keeping details for a future paper.

South Georgia is a very high ridge, rising very steeply out of the ocean. The mountains, in general highly inaccessible, rise to heights of more than 6000 feet. Great masses of ice occupy vast areas; mighty glaciers open out into the fiords, and hanging glaciers are met with a short distance from the coast. Glacier rivers and brooks from perpetual snow-fields are to be found everywhere, exercising a great influence on the distribution of plants. The lowland occupies a very small area, and is broken by steep ridges into narrow valleys, opening on to a level beach, covered by sand and pebbles. On these shores and in these valleys we find the vegetation of South Georgia. Besides that, the coast is extremely steep, having a very poor vegetation.

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* "Botany of the Expedition," published in *Die internationale Polarforschung*, 1882-83. *Die Deutschen Expeditionen und ihre Ergebnisse.* B. II. Hamburg, 1890.
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J. Müller: "Lichenes."
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P. F. Reinsch: "Die Süsswasseralgenflora von Süd-Georgien."
" "Zur Meeresalgenflora von Süd-Georgien."
C. M. Gottsche: "Die Lebermoose Süd-Georgiens."

I shall only say a few words about the climate of South Georgia. The summers are cold, snow falling even in summer-time. November is the month of spring according to the observations made by Dr. Will. We arrived there during the winter, but even in the beginning of May I found a few flowering plants, though, of course, they were mere exceptions. During our visit the lowest temperature observed was −11°·8 C.; the lowest noticed by the German station was −12°·5 C. Owing to the exceedingly strong wind, the climate of South Georgia is a severe one. The prevailing wind is westerly. Much snow falls during the winter; when we left the country the lowland was covered by more than 3 feet of snow.

On the level coast, especially when covered by sand and pebbles, we find the best locality for one of the most remarkable plants of the sub-antarctic regions—the tussock grass, *Poa cæspitosa* (Forst.), Hook. f. The large tufts showed still rather unfaded colours. On favourable places it reaches a height of 3 to 5 feet. Along the beach the tussock is often margined by *Acæna adscendens*, Vahl, that also grows amongst the tussock, when less dense. On the rocky shores the tussock forms a very broken carpet amongst the stones, hanging down from the rocks. Here also a small *Colobanthus* * thrives even in the narrowest clefts. *Amphiloma dimorphum*, Müll. Arg., covers the rocks down to high-water mark, visible from a distance by its bright colour.

The tussock vegetation expands from the coast into the glens, clothing also the surrounding mountains to an altitude of 800 to 950 feet. Even the steepest slopes are covered, if not exposed to rockfalls. In South Georgia, as well as in other countries, it keeps pretty near to the coast, and many of the small islets are covered by it.

The tussock grass always avoids moist ground. It ascends the slopes of the hills in well-marked tongues, but between the hills, where it could be more protected from the wind, we always look for it in vain. Where *Poa cæspitosa* does not grow, and where the ground is not too moist, we find the more level parts occupied by meadows, composed of *Phleum alpinum*, L. and *Festuca erecta*, D'Urv., the last perhaps more abundant. Forming dense turfs, the meadows go farther from the coast than the tussock, and also rise to a higher altitude. Besides the above-mentioned plants, *Aira antarctica*, Hook., is an important component, on moister places growing in spots of some square metres. *Acæna adscendens*, Vahl, and *lævigata*, Ait., are also very common. Round the base of the rocks, on moist slopes, etc., *A. adscendens* forms a dense carpet of some few inches in height; in the bottom one sometimes finds a small *Galium*, according to a preliminary determination, *G. antarcticum*, Hook. f. This plant was not observed on South Georgia before.

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* According to Engler, l.c., *C. subulatus* (D'Urv.), Hook. f. There seems to me to be a little difference between the South Georgian specimens and those from the Falkland islands which I have collected.

Mosses and lichens play a very important part in the meadows. Special species of *Polytrichum* are remarkable, forming large, extremely hard knolls. Amongst the lichens we remark *Sphærophorus*, sp., *Sticta Freycinetii*, Del., and *endochrysea*, Del., *Stereocaulon magellanicum*, Th. Fries, *Cladina rangiferina*, Hoffm., *Cladoniæ*, spp., etc.

The boggy ground is inhabited by *Rostkovia magellanica*, Hook. f., easily visible from a distance through its dark brown colour. Amongst the always abundant *Rostkovia* we find, more sparingly, *Juncus Novæ Zelandiæ*, Hook. f.; *Ranunculus biternatus*, Smith; *Acæna adscendens*, and *Aira antarctica*. As the low land between the hills is extremely well irrigated, the *Rostkovia* vegetation occupies large areas in South Georgia. If a stream gets into a tussock vegetation it will very soon transform it, the *Polytrichum* and *Rostkovia* coming in and forcing out the tussock.

Here I will remark that on a very moist place in Cumberland bay I found some spots with abundant *Poa pratensis*, L., not before observed in South Georgia. This plant is very common near all colonized parts of Tierra del Fuego and the Falkland islands. The locality on South Georgia lies close to a harbour that has been several times visited by sealing or whaling ships.

In the close vicinity of the rivulets we find a vegetation, particularly composed of some mosses, growing very luxuriously, especially at the small waterfalls, in which South Georgia is rich. Amongst the moss *Montia fontana*, L. often thrives. *Acæna adscendens* is also very common by the margins of the rivulets. In the bed grow *Callitriche verna*, L. and *Ranunculus biternatus*, always only in vegetative state, but very luxurious.

A rather peculiar flora inhabits the large areas of boulder clay that I got an opportunity to see on South Georgia. It is to be regarded as a poor meadow on stony ground, the phanerogamic plants being scarce. *Festuca erecta*, *Phleum alpinum*, *Aira antarctica*, and both kinds of *Acæna* are to be found. Characteristic of this soil is *Colobanthus crassifolius* (D'Urv.), Hook. f. The cryptogamic plants are more abundant; especially one *Lycopodium*, probably *L. clavatum*, L., var. *magellanicum*, Hook. f. (a Lycopodiacea was not met with before in South Georgia), amongst the mosses a very peculiar *Polytrichum*;

numerous lichens—for instance, *Stereocaulon magellanicum*, *Cladina rangiferina*, *Cetraria*, sp., and *Sticta Freycinetii*. Here and there, where the soil is still more moist, a spot of *Rostkovia* appears.

The higher up we come from the surface of the sea, the more desolate and barren is the land, the more poor the vegetation. Already on the tops of low hills, only about 300 feet high, we see, if the locality is a little windy, nothing but a moor of lichens: *Spherophorus*, sp., *Stereocaulon magellanicum*, *Neuropogon melaxanthus* (Ach.), Nyl., *Sticta Freycinetii;* other species encrust the stones, especially *Rhizocarpon geographicum*. The phanerogams are the same species seen in the meadows, though very scarce.

At an altitude of about 900 feet, we still find meadows on the more favoured slopes, but then they disappear, the individual becoming more dwarfish too. I have gathered *Festuca*, *Phleum*, and *Aira* on an altitude of about 1500 feet; the *Acæna* species does not go so far; *Acæna lævigata* thrives better on the stony places than the other. *Aira antarctica* is perhaps the most hardy of them all; it is the most southern phanerogamic plant known hitherto. South Georgia has no special alpine flora. Two ferns seem to prefer the clefts higher up in the mountains, viz. *Aspidium mohrioides*, Borz. and *Hymenophyllum peltatum;* Desv. *Cystopteris fragilis*, collected in the mountains at Royal bay by Dr. Will, was not met with during our visit.

The well-known *Neuropogon* (*Usnea*) *melaxanthus*, characteristic of the mountains in the sub-antarctic and antarctic regions, is very common here too, but only on sheltered situations it appears in its full strength, forming tufts about 3½ inches high, richly covered with fruit. The colour varies from light sulphur-yellow to dark green or black.

On the higher crests, where the dreadful gales rage without any obstacle, we look in vain for anything but a few barren mosses, or even only some poor lichens encrusting the stones.

In a few words to summarize our knowledge of the South Georgian vegetation and its conditions of life.

South Georgia is an ice-covered highland where the level land has a very subordinate position. On account of that, a richer vegetation inhabits only a small part of the coast region. Of the south-western coast we know very little, mainly that the conditions there are much worse than on the north-western side, of course owing to the complete exposure to the usual direction of wind.*

All slopes towards the north show a much richer vegetation than those towards the south.

The poorness of different species is very great. After our visit we now know fifteen phanerogamic plants and four ferns, all these also found in other parts of the world. The lichens—twenty-six kinds, eight of which were described as new species,* and especially the mosses (fifty-two Musci † and eleven Hepaticæ ‡) are richer developed. Their number will perhaps become a little enlarged, when my collections are worked out. As for the mosses, it is very remarkable and singular that fifty-one of the fifty-two Musci and seven of the eleven Hepaticæ were described as new species.

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* Klutschak, H.: "Ein Besuch auf Süd-Georgien," *Deutsche Rundschau f. Geogr. u. Statistik*, iii. Jahrg. 11 Heft.

As to the vegetation of the sea. *Macrocystis pyrifera*, Ag. forms a band along the coast and fills the shallow bays with its dense masses. Amongst the kelp live a lot of different algæ, both brown, red, and green, some distributed also in other parts of the South Atlantic ocean, and others only inhabiting the sea round South Georgia. Shallow basins on the beach are very common; they are filled up by a beautiful and rich vegetation, and clothed by calcareous algæ. On the rocks *Ulva latissima*, L.* and *Enteromorpha Novæ Hollandiæ*, Kütz.† often live in great masses. Here, as well as in the arctic regions, the vegetation of the sea carries off the palm.

Port Stanley, Falkland Islands, August, 1902.

THE MEDITERRANEAN COAST REGION OF EGYPT.

By Major RYCROFT.

I. THE WESTERN COAST-LINE.

THERE is no country which apparently ends so abruptly as Egypt, for when once the cultivated portion, which is the land irrigated by the Nile inundation, is passed, the traveller finds himself in what appears to be a limitless extent of absolute desert. This is marked on maps as the Libyan desert, and the actual frontier, where Egypt marches with Tripoli, is a line passing south from a point on the Gulf of Sallum, 320 miles to the west of Alexandria. Although the whole is described as desert, this is hardly a word applicable to the greater part of the actual coast-line, as there is a belt some 15 miles in breadth where, in the winter, a considerable amount of corn—barley, with a little wheat—is grown, the soil being light but good. Along this belt there are numerous wells, and sufficient herbage to sustain considerable flocks of sheep and goats, with a few cattle, horses, and donkeys, in addition to large herds of camels.

In ancient times, *i.e.* in the days of the Ptolemies, there was considerable traffic along this coast, as it was the main route to the temple of Jupiter Ammon, in the Siwa oasis, those going on the pilgrimage either proceeding the whole way by land or going by sea to Marsa Berek, the ancient Kabanadom, or Marsa Matru, the ancient Paroetorium, thence by the desert route. In addition to the pilgrims on the way to consult the oracle, there was a large population, which, judging from the various ruins along the coast, must have lived in substantially built and carefully laid out cities. Whether or no climatic conditions have altered it is hard to say, but it is evident that in old times, as now, water was of great value, for on all the sites of ancient cities or halting-places on the road to the sacred temple are to be found large cisterns hollowed out of the solid limestone rock. These cisterns are numerous and very large, the usual size being 7 yards square by 15 feet deep, giving a capacity of over 40,000 gallons, and the great value attached to them is shown by the massive foundations of walls, by which in most cases they were evidently surrounded and guarded.

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* J. Müller, *l.c.* † C. Müller, *l.c.* ‡ C. M. Gottsche, *l.c.*

The inhabitants of this region are Arabs of the Awlad Ali tribe, who mostly lead a nomadic life, though in places the more wealthy of them inhabit stone-built huts, using in many cases ancient catacombs and cisterns as granaries and storehouses. In October, after the first rain, they commence to plough near the sea, extending their cultivation as the rain recurs, at the same time drifting further from the coast, accompanied by their flocks, which at this season lamb. In March and April they harvest their crops, and drive surplus sheep, camels, etc., towards Alexandria for sale, many of them remaining near Mariut during the heat of summer. These Arabs are all followers of the Senussi, whose representatives reside at the Zoweirs (religious schools), which occur at intervals along the coast. The extent of their influence may be judged from the fact that smoking, an Arab's most cherished habit, has been entirely given up in obedience to the chief's commands. There is but little trade in this area, though in the autumn caravans carry dates from the Siwa Oasis to Egypt chiefly by way of the Wady Derah, while camels, sheep, and goats find their way in the spring to the Behera province of Egypt, and some barley, which is especially valued for malting, is exported to Alexandria. During the summer months numbers of sponge-fishers, chiefly from the Grecian archipelago, sail across to the harbour of Matru and get large quantities of sponges from the neighbouring reefs; while in the autumn a big trade is done in quails, as these birds then arrive in large quantities from the north and, alighting along the coast, are taken by the Bedawin in great numbers. Greek traders form depôts at convenient points, and the quails are taken to Alexandria by sailing-boats, at least one million being forwarded there in a good year.

A few words on the nature of the coast may not be out of place. As a whole it is inhospitable, studded with dangerous reefs, and greatly exposed to the prevailing north-westerly winds. There are, however, good anchorages in the Gulf of Sallum, also to the east of Ras-el-Kenais, which is about midway between Sallum and Alexandria. There are also, principally between Ras Bulau and Ras-el-Kenais, several small marsas, or harbours, which give good protection for small boats. These marsas are, however, difficult of approach, the entrances being in all cases through narrow and generally shallow openings in the reef, while they are in no way lighted or buoyed. In ancient times, both Marsa Berek and Marsa Matru were important harbours, and an attempt is now being made by the Egyptian Coast Guard Administration to improve the latter. The climate on the whole is delightful, being only really hot for some three months, and even then tempered by sea-breezes, while during the winter months it is fresh and bracing. There is no proper record of the average rainfall, but it is undoubtedly greater than that of Alexandria, which averages about 8 inches per annum.

To those interested in archæological research, a trip through this district would be of the greatest interest, as everywhere one comes across the well-preserved foundations of ancient towns, which should well repay careful investigation.

II. THE EASTERN COAST-LINE.

From the Suez canal to Rafah, which, situated 30 miles beyond El Arish, is the actual frontier between Egypt and Palestine, is a distance of 140 miles. The whole is shown on most maps as desert, with a broad belt bordering on the Mediterranean marked as shifting sand-dunes. In former times the route from Salhieh to El Arish *viâ* Kantara was greatly used, and large caravans constantly passed along it, but the now existing sea-transport being cheaper and quicker, there is but little traffic.

Crossing the canal by ferry at Kantara, one enters a scrub-covered plain, which extends for about 16 miles, with a very gentle rise towards the east, when the zone of shifting sands is encountered, and the road at once becomes deep and difficult. These dunes, which in places rise as high as 200 feet, are composed of the finest particles of sand, and under the influence of the prevailing winds, here chiefly from the west, but varying from north-west to south-west, have a tendency to move in an easterly direction. After 9 miles of deep sand, the road for 5 miles crosses a somewhat marshy plain fringed by palm groves. This is the oasis of Gatya, where somewhat brackish water is found, from 6 to 12 feet below the surface, everywhere within a radius of some 20 miles, and very large numbers of date-palms are grown. They are owned by Bedawin, most of whom, however, live the greater part of the year in the Sharkiyeh and Dakahliyeh provinces of Lower Egypt, visiting this part of the desert to collect the dates in August and September. From Gatya the road again enters the region of shifting sands, and passing Bir-el-Abd (16 miles) leads to Bir-el-Maza (32 miles), which is the only water between Bir-el-Abd and brackish wells in the palm groves near El Arish some 26 miles further on. El Arish is a mud-built town with a population of some five thousand, nestling under a small fort 1½ mile from the sea, and to the west of the Wady Arish, and appears to be threatened by advancing sand-dunes. The usually dry river Arish here enters the sea, and in the valley, which is about 1½ mile broad, are large palm groves and gardens with many wells. The desert from the Suez canal to El Arish is subject to very bad dust-storms, which are much dreaded by the Arabs, and frequently last for several days, as I can testify from my own experience. With the object of ascertaining whether the canal between Port Said and Ismailia can be reached without crossing the zone of shifting dunes, I returned by a more southerly route to Ismailia. South of El Arish the country is chiefly undulating desert sloping upwards towards the south, with a considerable amount of rough grass and low scrub. It is drained by the Wady Arish, which, starting on the high plateau some 150 miles to the south, is generally quite dry, though after rain—an event of rare occurrence—it becomes a river of considerable volume. Rising abruptly out of this plain are isolated blocks of hills, of which the chief are Jebel Hellal, Jebel Yellag, and the Moghrarah hills, all rising to a height of some 3000 feet above the sea.

Following the dry bed of the wady for about 10 miles, the track reaches Bir Lefun, an ancient stone-built well, recently cleaned out, 50 feet deep and with some 6 feet of fresh water. It thence strikes south-west for 25 miles to the Wady Surr, which here emerges from a narrow gorge in the Moghrarah hills, and joins the Wady Arish a few miles north of Jebel Hellal. The Moghrarah hills are much intersected with steep-sided ravines, which all drain into the Wady Surr. They are permanently inhabited by the Minsofia Arabs, a small and somewhat lawless tribe, while in the spring Arabs of the Terebin tribe, as also the Aardi and Tayhah, drive flocks to graze on the pasturage, which is then good. There are several old wells and cisterns, the chief of which is Bir Moghragah, situated some 15 miles within the hills. To reach it one has to follow the main bed of the wady up a winding ravine; near the head is a solidly built but now ruined stone fort. The cistern is hollowed out of the solid rock, and so placed that after rain it is filled by the stream that then flows down from the surrounding hills. When visited by me in December, 1901, the tank was quite full, but as it is tunnelled into the rock it was impossible to ascertain its size. From descriptions given by natives, it must, however, be very large, holding at least 40,000 gallons. The age of the fort and cistern is hard to fix, but from their style they probably date back to Ptolemaic times, viz. about 300 B.C. Some 4 miles beyond the cistern the watershed is reached, and the track, impassable for loaded camels owing to its steepness, leads down through a narrow valley into an open plain. Here, after the winter rain, a little barley is grown, while, as good grazing is obtainable, considerable flocks of sheep and goats are nearly always to be found in the neighbourhood. After crossing the edge of the shifting dunes, here some 50 feet high, Jebel Gederah is reached. This is an isolated hill rising to 1500 feet, and as water, though somewhat brackish, can in the winter be got by digging in the wadys, it is a favourite grazing-ground for the Aardi Arabs, whose headquarters are near Ismailia. To strike hence direct to Ismailia would entail a very difficult march of 45 miles right across the shifting sand-dunes. These can, however, be almost entirely avoided by making a *détour* somewhat to the south, the left shoulder being brought up when the shore of the Great Bitter lake is reached; thence to where the Suez canal is struck north of Lake Timsah the going is good.

With the exception of the five thousand inhabitants of El Arish, of whom only one thousand are Bedawin, the country from the line Port Said—Ismailia to the frontier of Palestine is very thinly populated, the chief tribes being:—(1) The Terebin Arabs, who inhabit the lower part of Palestine. They are a powerful tribe, owning large herds of camels, many sheep and goats, and a certain number of horses. (2) The Sowarki Arabs, who reside in the low country along the coast from Gatya to Raffa; of these there may be some five thousand (men, women, and children), of whom the majority live near and to the east of El Arish, cultivating barley and breeding camels, sheep, and goats, also a few horses. (3) The Aardi Arabs live around and to the east of Ismailia, and have grazing rights as far as the northern slopes of Jebel Mogharah. They possess a considerable number of camels, also sheep and goats. (4) The Minsofia Arabs live in and around Jebel Moerib, but are few in number. (5) Near Bir Hassanah, and thence to the south-east, are the Tayhah Arabs, whose headquarters are at Nackl. It is difficult to ascertain the number of Bedawin who permanently reside in the desert, but it is very small, as there is an increasing tendency to move to the edge of the cultivation in Lower Egypt, leaving their breeding flocks and camels in charge of dependents. There is but little game in this desert, though near to the Suez canal, particularly between Kantara and the Bitter lakes, there are numbers of gazelle, while in Jebel Hellal, Jebel Jellag, and occasionally in Jebel Moghrarah, the small ibex of the Sinai peninsula is met with. In all the above-mentioned hills a certain number of partridges are found, while in addition sand-grouse and small desert hares are pretty common.

Should it ever be necessary to carry a railway across this desert, I am confident that the best route would be along and close to the sea, as, owing to the ever-shifting dunes, the task of building and maintaining a line crossing the sand-belt would be well-nigh impossible.

A VISIT TO THE HOGGAR TWAREGS.

By W. J. HARDING KING.

WITH the object of seeing something of the Sahara, and of visiting, if possible, a camp of Hoggar Twaregs which I heard had been seen in the desert south of Tugurt, I set out from Biskra with a small caravan on March 19, 1900, along the great trade-route stretching southwards into the desert.

STREET IN TUGURT.

At a distance of some 17 miles from our starting-point we crossed a small brook, which in dry weather represents the Wad Jedi. This little stream, however, when rain has fallen heavily in the mountains to the west of Biskra, where it takes its rise, becomes a huge and impassable morass, several miles in width, which, since it runs almost due east and west, completely cuts off all communication with Biskra from the desert lying to its south, and, as it sometimes remains in this swollen condition for over a week, causes the greatest inconvenience to travellers.

The desert lying to the north of this stream is called by the Arabs the "Little Sahara," to distinguish it from the "Great Sahara" lying to its south, and from those vast and little-known tracts lying still further south beyond Wargla, which are somewhat vaguely alluded to by them as the "Great South."

Beyond the Wad Jedi the country changed, and the track emerged on to a slightly rolling plain, covered with small scattered bushes and clumps of coarse yellow grass, which stretched away into the far distance to a horizon literally as straight as at sea.

The road, at the season of the year at which our journey took place, carried a considerable traffic, consisting chiefly of caravans coming north from Tugurt and the Wad Rir oases with loads of dates, or proceeding south from Biskra laden with grain. Occasionally a Jew with a few mules laden with barrels of oil was met, or the members of an Arab camp migrating northward towards their summer quarters in the Tell, or fertile district near the coast. The particular tribe to which these caravans belonged could easily be identified by the pattern of the *kerratas*, or camel-bags, with which their beasts were laden, which were striped in red, black, brown, or grey, in streaks of varying widths.

During the course of our second day's journey we passed, at 32 miles from Biskra, the oasis of Shegga, the first we had seen since our starting-place. It is here that the little-used track from El Wad, by which we subsequently returned, joins the Biskra-Tugurt road. We spent the second night in the caravanserai of Setil, 45 miles from Biskra, within sight of which stood a group of some twenty mud pillars erected over the graves of the members of an Arab camp who had been murdered some years before by a party of raiding Twaregs.

For 3 or 4 miles beyond Setil the road, which had hitherto taken us over an almost perfectly level plain, rose very gradually until we reached Kef-el-Dohor, a slight hill overhanging the Shott Melrir, or Shott Merwan, as the western part of it is sometimes called. This hill was the only one we encountered during the whole distance from Biskra to Tugurt. The road descended from its summit by a steep gradient to the bed of the lake, lying below the sea-level, across the dry surface of which it led us almost to Urir, the first of the Wad Rir group of oases. From this point on as far as Tugurt we had always one, and sometimes three or four oases in sight, situated over the bed of the great underground stream, lying from 150 to 600 feet below ground, from which the group takes its name. Some of these oases are of considerable size—Mraier, for instance, contained in 1893 five artesian wells and 80,000 palms, and Urlana and Ghamra had each 30,000 palms. Nearly all of them are increasing rapidly in size under the auspices of the two French companies, the "Société agricole de Batna" and the "Compagnie de l'Oued R'ir," which are both doing excellent work and fast developing the resources of the country. Nearly all the water to be obtained in this district is brackish, and most of it, of course, comes from a considerable distance below ground. It is an interesting fact that primitive wells on the artesian principle have for centuries been in use in the Wad Rir oases.

The inhabitants of this district, who are known as the Ruara, present quite a different type from any to be seen in Algeria. They spoke a dialect of bastard Arabic, which my guide, who was an inhabitant of Biskra, had the geatest difficulty in understanding. They were nearly all black in colour, and many of them showed the frizzy hair, thick lips, and flat nose of the Sudanese negro; but there were others who were of quite a different type. They had the same dark-coloured skin and close-curling hair, but their high, narrow foreheads, thin lips, and clean-cut aquiline noses afforded a striking contrast to the negro type. It would be interesting to compare their faces with those of the Harratin and Zenata of the Twat district.

WARGLA, FROM A MINARET OF A MOSQUE.

On the 24th we reached Tugurt, the capital of the Wad Rir district. The oasis, besides the principal town from which it takes its name, contains several villages, and has a total population of some 6000 inhabitants. Its palm plantations form a perfect forest, containing in all over 170,000 trees. It is the headquarters of a military district, and is the scene of one of the most important markets in the Northern Sahara.

We stayed in the town a few days so as to be present on the market day. Besides carpets, hides, fleeces, dates, scents, spices, and the usual native products to be found in the Algerian markets, there was a considerable quantity of European goods displayed for sale. Among these cottons, cutlery, tinware, and small mirrors in metal frames seemed the principal items. The cutlery and calicoes of French origin were of very inferior quality, but there were a few rolls of English cottons, which showed a marked superiority to those bearing the names of French firms.

In the market were a large number of goats of the black hornless breed, for which Tugurt is famous. Nearly all these goats were disfigured by the abnormal growth of their hoofs, which in one or two cases had become so prolonged that they curled up in front of the legs until they almost touched the shin. Tugurt is built upon very sandy soil, and it is probably owing to the fact that this soft material has little effect in wearing down the hoofs that they have grown to such unusual lengths.

We left Tugurt on April 1, and continued our journey almost due south to Wargla. At 8 miles from Tugurt we passed Temasin, a *ksar* or fortified village similar to those in the Twat district and other parts of the Sahara. The houses on the outskirts of the place all joined up to each other so as to form a continuous wall, from which a small tower projected at intervals. This wall was surrounded by a moat, crossed in two places by a causeway leading to a fortified gate.

Six miles further on we passed Bled et Ahma. Beyond this oasis our road lay over the open desert for 90 miles until Ngussa was reached.

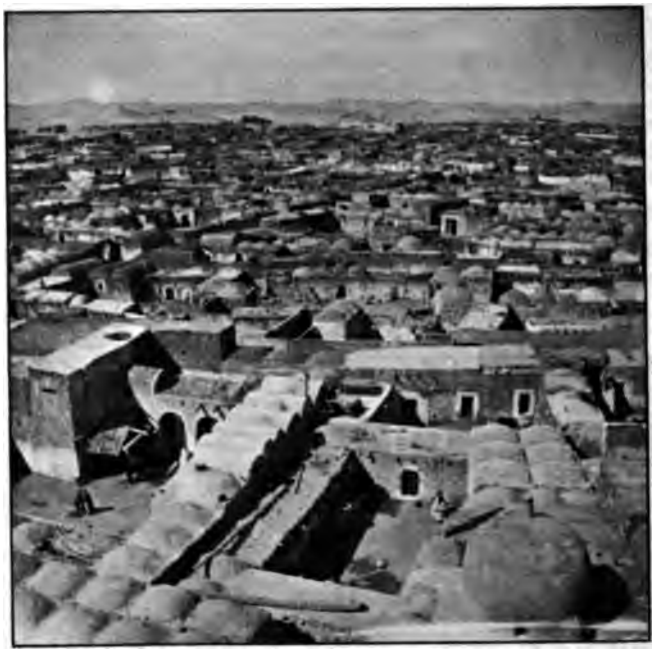
A march from Ngussa of 10 miles through a blinding sandstorm brought us to Wargla, 230 miles from Biskra. The uncovered streets and neatly plastered houses of the town offered a great contrast to the covered tortuous ways and rough mud-built walls characteristic of the old town of Tugurt.

Wargla has lost much in importance since the French occupation of Algeria. In the days of the Turkish rule in Barbary the town was one of the great centres of the trans-Saharan trade, and several times a year huge caravans coming from Timbuktu and the western Sudan poured some of the wealth of those fertile regions into the markets of Wargla and El Golea, whence it was distributed to all parts of the Barbary States. The slave trade was an essential feature of this commerce, and the suppression of this traffic in Algeria by the French rendered the trade less profitable, and caused it to divert east and west into Tripoli and Marocco respectively. The French operations conducted during the past few years in Twat and other parts of the Sahara and the Sudan have had the effect of suppressing the trans-Saharan slave traffic, and will perhaps for a time restore to some extent the trade to its former channels; but when the proposed routes from the western Sudan to the coast have been opened, an entire revolution in the commerce of this region is almost certain to follow, for transport by steamer and railway cannot fail to be cheaper, safer, and better in every way than the precarious method of camel porterage across the Sahara. The French, there is little doubt, will ultimately extend their railway along the Marocco border into Twat, and thus bring a European market into the heart of the Sahara. Probably gold-dust, ivory, and ostrich feathers and other articles of the Sudanese trade of high value in proportion to their weight and bulk will continue in small quantities to find their way from the middle Niger district into Twat, and so on into Algeria; but the trans-Saharan trade as it formerly existed is practically at an end.

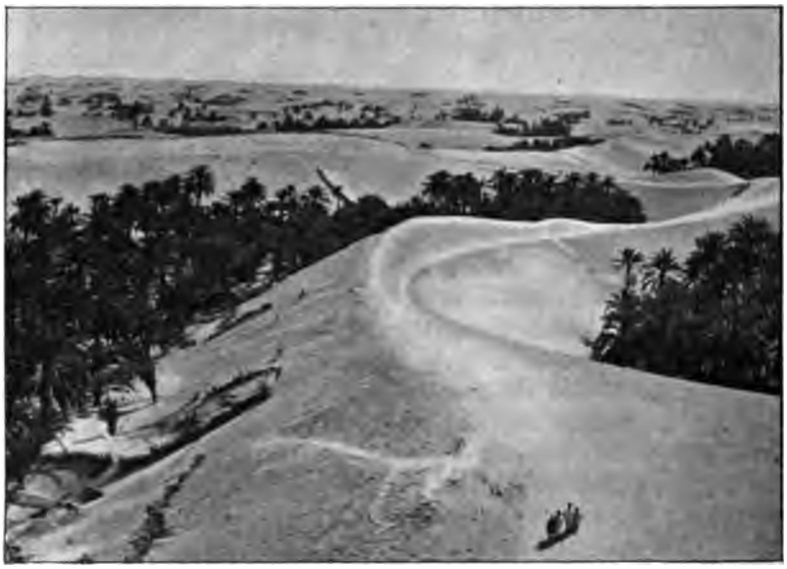
STREET IN WARGLA.

As we could hear no news of the Twaregs at Wargla after a stay of two days in the town, we retraced our steps by practically the same road as we had come to Tugurt.

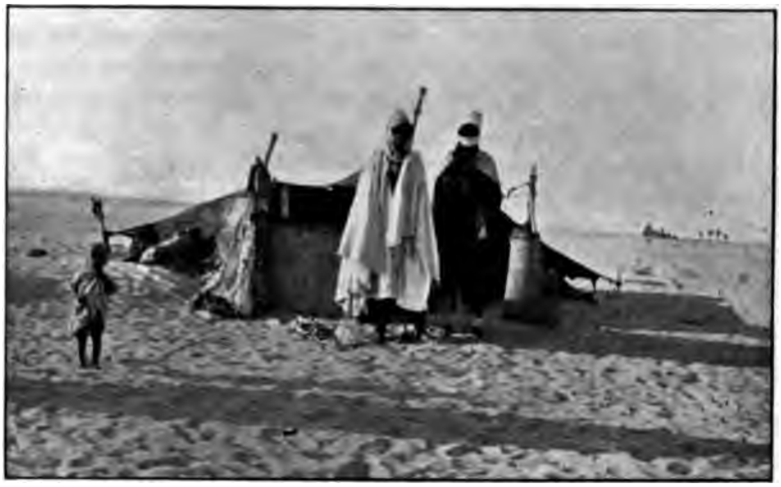
The heavy dust-storm which had occurred during our stay at Wargla had completely choked several of the wells with sand. Owing to an



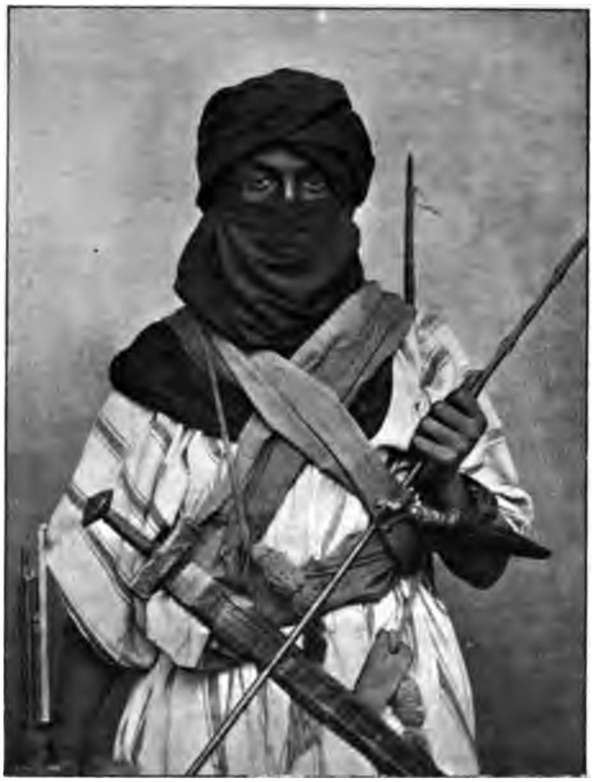
EL WAD, FROM MINARET OF MOSQUE.



PALM GROVES NEAR EL WAD, FROM MINARET OF MOSQUE.



A TWAREG TENT.



A TWAREG SHOWING THE "LITHAM," OR MASK OF BLACK COTTON.

accident, our only water-skin had been allowed to overflow, and, as we had no appliances for cleaning out the wells, for two days we were practically without water at all. We accordingly were compelled to make a slight *détour* off the road to ask for hospitality at the *zawia* (monastery) of Temelath.

This is one of the principal monasteries belonging to the Tijani order, whose adherents are widely spread over the north of Africa and the Sahara. In size it resembles a small desert town. Considering its situation in the heart of the Sahara, it is a wonderfully well built and highly decorated place. Not only the great mosque and all the principal buildings which it contains are decorated with coloured arabesques in raised stucco, but even the arcades spanning its streets are ornamented in the same way. The reigning marabout was a pleasant old gentleman of some sixty years of age, who had evidently a considerable quantity of negro blood in his veins. He entertained us royally, put us up for the night in a new *dar-dief* (house for

HOGGAR TWAREG (A NOBLE).

strangers) which had just been finished, and which was, if anything, a shade more gorgeously decorated than the mosque itself, and finally dismissed us on the following morning with a day's provisions and a blessing upon my Moslem followers.

On our return to Tugurt, we found that the Tarawek camp, of which we had been in search, was pitched in the neighbourhood of El Wad, and we accordingly set out in search of it.

Our road from Tugurt lay nearly due east. Almost as soon as we had left the oases we got among the sand-dunes, across which our road lay all the way to El Wad. These, though low at first, gradually increased in height as we neared our destination. The soft cream-coloured sand, which was almost as fine as the dust on an English highway, was extremely trying to both men and beasts to walk over. In ascending or descending the slopes, even the camels' legs sank in almost to the hocks. The glare, too, was very trying. Huge stone pyramids (*guemeerahs*) had been erected at intervals of about 10 miles

HOGGAR TWAREG (PROFILE).

all along the road to act as landmarks. In all directions could be seen raised lines marking the mole-like course of a little burrowing lizard known to the Arabs as the *hout-el-erdth*, or "earth-fish." The sand at midday was so hot as to be almost unbearable to the naked hand. The nomadic Arabs, when suffering from an attack of fever, or when wishing for some reason to throw themselves into a perspiration, cover their heads in their clothing and burrow into the side of a dune, where they remain until the desired effect has been produced.

Three days' journey, at the end of each of which we found a caravanserai, brought us to El Wad.

El Wad is built over the bed of a subterranean river—the Wad Souf—on the northern edge of that great belt of sand-dunes which runs, with an occasional break, all along the southern boundaries of Tunisia and Algeria. In forming a palm grove in this district, the natives choose one of the deepest hollows between the dunes, and excavate it still deeper until the water-level is nearly reached before planting the palms. The labour entailed in the construction and maintenance of these oases is enormous, for, in addition to the usual work required in a palm grove, the proprietors are compelled to wage perpetual war against the ever-encroaching sand, which with every breeze drifts in over the edge of the hollow, and, unless collected periodically, brought to the surface, and thrown out again, would soon smother and kill the whole plantation. The cultivator gets, however, a good return for his labour, for the crops in this district are far heavier than even in the famed oases of the Wad Rir group.

Half a day's march from El Wad brought us past the oases of Kouinin and Tarzout to Gomar, where there is a *zawia* affiliated to the same order as that at Temelath.

A few miles to the north-east of this oasis we found the Twareg camp of which we had been in search. Its inhabitants described themselves as belonging to the Hoggar tribe, and said that they had come up to buy some things at El Wad after camping for some time among the Askar Twaregs.

They were a tall, lanky lot, varying in colour from almost black to the complexion of a Spaniard or an Italian. The men all wore their characteristic *litham*, or veil, which concealed the whole of their features and in some cases even their eyes, so that, with the exception of their hands, feet, and a few coarse snaky-looking locks of greasy hair which stood up above their head coverings, nothing whatever of their persons was to be seen.

The tents which their camp contained were all constructed of leather, and, with the exception of that which belonged to the chief, were extremely small. The chief's tent was built with a span roof and sides about 4 feet high. Its furniture consisted of leather sacks containing clothing, eatables, etc., and a few richly coloured rugs made with a 3-inch pile, and strewn with leather cushions cut and dyed with a decorative pattern. Two projecting wings which overlapped at the ends stood out, one on either side, from the open end of the tent, forming a kind of outer court, so as to ensure complete privacy for the inmates. This open space was partly covered during the daytime by an awning, which at night was let down to close the end of the tent.

The dwelling was used as a kind of school for the junior members of the camp. The women, being the more highly educated sex, were the teachers. In one corner of the tent lay a small board covered with Arabic lettering, with which some of the children were being taught to read in that language, after having presumably mastered their own. The Twareg alphabet is, of course, entirely different from the Arab.

Our return journey from Gomar lay, until Shegga was reached again, all across the open desert, and presented few points of interest. There was a caravanserai at the end of each day's journey. At Sif el Menadhi we found one of the so-called "desert mosques," a small enclosure built of stones, measuring about 5 feet square, with a niche at one end to indicate the direction of Mecca. This was used as a place for prayer by the Arabs of the surrounding desert. A journey of four days from Gomar, during the course of which we twice crossed a branch of the Shott Melrir, brought us again to Shegga, from which point our road to Biskra was identical with that of our outward journey.

HOT SPRINGS AND VOLCANIC PHENOMENA.*

By Prof. **EDUARD SUESS.**

In immediate proximity to the most remarkable hot spring of the European continent, it seems appropriate to direct your attention to the question of the causes to which such springs are due. The older views set forth in the text-books tell us that hot springs are fed by water percolating down from the surface of the ground, which at a certain depth attains a high temperature, and ascending again at that temperature, brings with it in solution solid substances from the rock. From these conditions it might be possible, knowing the mean gradient of temperature from the surface downwards, to assign approximately a minimum depth reached by the percolating water, and by analysis of the water to learn something of the composition of the rocks through which it has passed.

But in 1880 Franz von Hauer, F. von Hochstetter, and Heinrich Wolf, when consulted with reference to the preservation of the Karlsbad springs, expressed considerable doubts as to the water of the springs coming from the extensive infiltration area, chiefly composed of granite, in the neighbourhood. G. Laube found it impossible to account for either the quantity of water itself or of the carbonate of lime in the deposits, on the hypothesis that they were derived from granite. Ludwig and Mautner had similar difficulty in accounting for the sodium present, and suggested that the bulk of the matter in solution must be derived, not from the granite, but from the unknown under-strata of the Earth's crust. Rosiwal was unable to find any correspondence between the yield of the hot springs of Karlsbad and the distribution of rainfall in the region, and concluded further that the carbonic acid must be derived from a heated magma.

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* Abstract of lecture at the meeting of the Congress of German *Naturforscher und Aerzte*, held this year in Karlsbad. By Prof. Eduard Suess.

It is likely that similar difficulties have been experienced in many regions where hot springs occur. My intention is not to present to you a new theory, but rather to redirect attention to an old one, which, undeservedly as I think, has lately fallen somewhat into the background. But before doing so, I must, for the sake of brevity in what follows, explain the meaning of two expressions. In a well-known paper on metallic veins, published in 1893, Posepny has used the term "vadous" to distinguish infiltrating waters, *i.e.* those of superficial origin, in contradistinction to waters rising up out of the depth. We shall retain this expression, extending it so as to include not merely percolating waters, but all the waters of the hydrosphere—oceans and rivers, clouds and rain. Vadous waters, often impregnated with carbonic acid, penetrate from the surface into the upper strata, where by solution and deposition they form deposits of mineral substances. The waters which, having been warmed, come to the surface in artesian borings are vadous. Thus we may also have vadous carbonic acid, which appears with marsh-gas in coal-beds, and vadous compounds of chlorine, bromine, iodine, and sulphur in the oceans and in salt deposits. The sulphuretted hydrogen separated by the action of bacteria in the depths of the Black sea is also vadous.

The second expression to which I would refer is "pulsation" as applied to springs. There are two kinds of pulsating springs. First, the type of pulsation familiar in the geysers of Iceland. The geyser has a cylindrical tube formed of sinter. Blasts of superheated steam, entering the tube laterally at great depths, are subjected to the pressure due to the column of water in the tube, which raises the boiling-point, let us say, from 100° to 124° C. Successive hot blasts eventually raise the temperature to 124°, and the explosion follows: the upper column of water is blown into the air, water is suddenly discharged from a lower column below the point where the steam entered, the cylindrical tube is emptied, and then slowly refilled from below. We observe that the blasts of steam are hotter than the column of water, the temperature of which rises till the explosion occurs, and then sinks. Pulsating springs of this kind may be specifically termed geysers, or boiling springs.

The Karlsbad springs are also pulsating, but the pulsations are less regular; they occur at short intervals, and are due to a different cause. Over the system of springs lies a mass of deposit, pierced by numerous holes. In this mass carbonic acid gas collects until its pressure is sufficient to force the water out, and since the cavities are irregular, so also is the rhythm of the springs. Springs of this type may be called "bubbling springs" (*Sprudel quellen*). Here we have an important distinction. Boiling springs are not subject to hydrostatic pressure like the waters in artesian wells. The characteristic of hydrostatic pressure is its uniformity; intermissions of long period would be impossible. In the case of the bubbling springs it is difficult to judge from the nature of the movements, but in Karlsbad at least a continuous hydrostatic pressure up to the surface cannot be admitted.

The occurrence of periodic variations in the action of certain volcanoes has long been recognized; these are commonly known as "strombolic" phases of eruptive action, and the quiescent pauses may be anything from a few seconds to several hours. In this connection I may be allowed to describe an experience which made a great impression on me at the time. In January, 1871, Vesuvius formed a "parasitic" crater at one side of the main crater, and 60 or 70 metres below it. Looked at from a distance, this crater presented the appearance of a jagged protuberance on the side of the main cone of the volcano. On the night of March 31, the weather being clear, as we were standing on the St. Lucia quay in Naples, we distinctly saw rhythmical flashes issuing from the small crater at intervals of six to eight seconds, while similar flashes came from the main crater once in two minutes. The two centres of activity were thus to a certain extent independent of one another, but since they must certainly have been fed from a common deep-seated vent, the separation must have taken place comparatively near the surface, and only the upper part of the vent can have been concerned in the rhythmic movements. The analogy with the geyser was so close that one was forced to the conclusion that Vesuvius is merely a form of boiling spring. On the following day we were able to enter the parasitic crater, and saw the flame bursting out of the vent to the height of about a métre every six or eight seconds; bubbles the size of one's head were blown out of the glowing mass, and blazing pieces of slag hurled into the air; then the flame sank, and a new skin of slag formed over the mouth of the vent, to be blown off in turn by the next explosion. Clouds of steam hovered over the outlet, and hydrochloric acid and acids containing sulphur were present. The general appearance was simply that of a geyser, which ejected melted stone as well as heated gases. Stones were also thrown out by the main crater of Vesuvius. Each of these seemed to draw a tail of steam behind it, and as they fell on the ashes in front of us they were covered with a white crust of sodium chloride. We were confronted again with the old puzzle: the eruptions themselves seemed to be caused by steam, as in the geysers, and the chloride of sodium pointed to the sea beneath us, but how could sea-water percolate into regions of such extraordinarily high temperature? Thirty years separate us from the experience of that day; the same puzzle has presented itself to many investigators in that time, and with a multitude of new observations to help us, we may turn again to seek a solution of the problem.

Silvestri observed the rhythmical action of Etna before the eruption of 1879; Mercalli studied Vesuvius in different years; and Bergeat has made observations on Stromboli. It is obvious that in a natural phenomenon like this one cannot expect the precise regularity of the pulse of a living creature—small lateral passages in the depth, and similar fortuitous circumstances, often cause the periodic outbursts in boiling springs to be preceded by a series of smaller disturbances, which follow no regular period, and the true rhythm of the main explosions is only recognized when the smaller ones are neglected. The great feature of the boiling springs is the irregular entrance of the gases, the explosive power of which increases towards the mouth of the vent.

I believe that the blasts of hot gas in the parasitic crater of the volcano are the source of heat, in precisely the same way as the blasts in the sinter tube of the geyser, and that they are the primary cause of the melting of the lava and of its intermittent outpouring. One is strengthened in this view by the circumstance that sounds like reports of subterranean cannon usually precede great eruptions, the result of the access of superheated vapour to cooler surroundings. These dull reports become gradually more frequent, until at last the first white ball of steam is shot out of the crater; the boiling lava follows later, itself saturated with steam. Be this as it may, it is at least certain that the quantities of steam issuing from the parasitic crater must come from a zone in which the temperature equals or exceeds the melting-point of most rocks, and in which there can be no question of porous or fragmental rocks, and therefore no question of infiltration of vadous water.

Turning now to the gases accompanying the eruptions. After steam, chlorine and gases containing sulphur, are the most important, and carbonic acid gas comes next. Their occurrence follows a definite law. So far as it has been possible to approach them, all fumaroles actually within vents contain steam; but the hottest fumaroles (over 500° C.) on the surface of cooling lava-streams, where approach is easier, are dry. In the emanations from these high-temperature fumaroles are found chlorine compounds, and along with them fluorine, boron, and phosphorus, substances which are the first to disappear as the temperature of the fumarole sinks. Sulphur persists longer, often combined with arsenic. Carbonic acid is given off freely till a much later stage, sometimes till the fumarole is comparatively cool, notwithstanding that it is observed in the hottest dry fumaroles. Fumaroles in different "phases of emanation" may occur quite near one another. The steam of the volcano cannot be derived from vadous infiltration, for if it is, whence the carbonic acid? Both must come from the deeper regions of the Earth; they are the outward sign of the process of giving off gases which began when the Earth first solidified, and which to-day, although restricted to certain points and lines, has not yet come to a final end. It is in this manner that the oceans and the whole vadous hydrosphere have been separated from the solid crust. Volcanoes are not fed by infiltration of the sea, but the waters of the sea are increased by every eruption.

From volcanoes, we come naturally to the question whether the water of boiling springs is vadous or hypogene. The Erzgebirge, which structurally belong to the Karlsbad granite, are traversed by numerous veins, *i.e.* by cracks or fissures, filled up sometimes with quartz or hornstone, sometimes with the ores of different sorts from which the mountains derived their former value and the name they still retain. The mining industry, and the studies of the famous Freiberg school, have made us acquainted with the formation of the Erzgebirge; and one of the most distinguished representatives of the school, whose name cannot be mentioned in an assembly of German naturalists without evoking expressions of enthusiastic admiration, Hermann Müller, recognized more than forty years ago the bearing of these mineral veins on the question we are now discussing. Since the hottest fumaroles of a volcano are dry, the deposits found in them must be the products of sublimation: all later, or *sulphide*, fumaroles contain water, their deposits will be stratified or banded, and in the succession of deposits the greater solubility of the compounds comes into prominence. With reference to this we may quote the following experiments on the nature of mineral veins. Deposits of tin belong to the hottest type, in which the temperature is higher than occurs in thermal springs, and for the most part higher than that of the "sulphide" phase of vein-formation. In contrast to this, the hot springs may be taken as the latest phase of a whole series which led up to the present deposits of ore: such springs occur here and there throughout these deposits. They are for the most part alkaline, and sometimes extraordinarily rich in sodium chloride; the amount of salt in the Karlsbad springs is remarkable, issuing as they do from granite. But the alkalies are not found in the ore deposits, not because they were absent at their formation, but because of their greater solubility. Thus we have at the one extreme the tin layer, at the other the alkaline hot spring with free carbonic acid. In the mine we can recognize the traces of the fumarole above 500° C., as well as of the tepid salt ascending water. Vadous influences are not wanting in the upper levels, but they are adventitious, and the alkaline hot springs in the fissures are only the last of a series of events which have their origin deep in the Earth's crust; in spite of their low temperature, and their carbonic acid, they are to be regarded as hypogene waters. Karlsbad is situated on the outcrop of a vein. It now becomes possible to interpret the observations of the miners. If we could clear away all disguises, and clearly see the system of springs as a whole, we should see that it pierces the granite in two distinct ways: in one part it is covered by its own deposits of lime, but in the depth are deposits of hornstone, binding fragments of the granite into a breccia exactly as the springs of Plombières do in the Vosges, notwithstanding their lack of soluble matter. Veins of hornstone and also of arragonite extend through the surrounding granite, and the observations of Knett leave it an open question whether the deposits of Karlsbad are not intermediate between hornstone and limestone.

The relations of hot springs to mineral veins are further of value in the interpretation of their chemical composition. The efforts of experts have recently been directed afresh to finding an explanation of the filling up of veins by lixiviation from the surrounding rocks, but exact experiments have proved that filling up in this manner, without addition of material from the depth, is inexplicable. The case is similar to that of the Karlsbad springs. At Vesuvius the nearness of the sea made it doubtful at first if the salt were not of marine origin; but here, in the middle of a continent, the salt appears again, both in springs tapped by mining and in the Karlsbad springs. The substances coming from the depth consist of readily soluble compounds, while other more easily separated substances—the metallic compounds—remain behind. To this we must ascribe the quantities of Glauber's salts, soda, and sodium chloride, to which the waters of the Karlsbad springs owe their curative properties. The great quantities of free and loosely combined carbonic acid are undoubtedly of hypogene origin; we know that they correspond to a late phase of volcanic activity, following the basalts. If we look at the elements rather than the compounds which occur in the Karlsbad springs, we find traces of older phases. From the hottest stage we have chlorine, fluorine, boron, and phosphorus, while the metals of this stage—tin, bismuth, molybdenum, etc.—are wanting. Sulphur is present, and with it selenium and thallium, rubidium and cæsium, the accompaniments of the sulphide phenomena in many volcanoes; also arsenic and antimony, the ordinary representatives of the sulphide ores, and zinc as a relic of the ores themselves. There remain sodium, potassium, and lithium; calcium, magnesium, and strontium; iron and manganese; aluminium and silicon. Every one of these is met with in mineral veins, and nearly all occur as volcanic products.

To sum up. The temperature of the gases ascending in volcanoes equals or exceeds that of the melting-point of most terrestrial rocks, and these gases cannot be derived from vadous infiltration. The hottest fumaroles are dry; steam and the substances dissolved in hot springs belong to later phases. The covering of tin on the sulphide veins of the Erzgebirge corresponds to the hottest subliming phase of this stage of activity; the other veins—the real sulphide ores—belong to a later stage. The hot springs which burst from the surface at the present day are but a relic of this stage. Along with them we may place the issuing streams of free carbonic acid, noting their close connection with the great basalt zone of northern Bohemia, extending into Silesia.

We may therefore conclude that there are vadous springs and hypogene springs. The term "hypogene" may be applied to springs which are the survivors of volcanic activity, originating in the depths of the Earth's crust, and bringing water to the surface for the first time. As the use of this term, here applied to curative springs, is based on geological considerations, I need hardly guard myself against erroneous therapeutic applications of it. The water of the Karlsbad springs is hypogene water.

All attempts to delimit an infiltration area at the surface for these springs, or to ascertain the depth from which the water rises out of a so-called thermal layer, are vain. Any attempt to determine the general structure and composition of the granite is equally hopeless; the cavities from which, according to an old estimate, 5,880,000 kilograms of solid material are removed every year, do not exist. Karlsbad stands on a drift of hornstone. If its warm waters still separate the heavy metals in the depths, a mineral vein is in course of formation, and the waters reach the surface impoverished; but it is hardly possible to ascertain whether such action is going on, although it is suggested by the arsenic, antimony, and zinc.

Springs may be easily classified into five groups. First, the ordinary fresh-water spring. Second, springs of vadous water, having the mean temperature of the soil, but characterized by special mineralization, like the iodine waters of Hall and Darkau, and the bitter waters of Saidschütz and Püllna. Third, mineral baths (Wildbäder). Fourth, hypogene springs, not varying in temperature or quantity with the seasons of the year, and having any degree of warmth from the mean temperature of the soil up to over 70° C., sometimes neutral, sometimes weakly mineralized with small quantities of Glauber's salt, common salt, or soda, and sometimes strongly mineralized with the same substances; for example, Marienbad temperature (11°·2 C., from granite) and Karlsbad (73°·8 C., from granite). The fifth group includes the boiling springs, of which no example occurs on the continent of Europe. The free carbonic acid stands, to a certain extent, in an independent position, as is shown by the quantity of it in Karlsbad, and the number of cold acid wells and dry exhalations of carbonic acid gas.

The five groups of springs named do not include every species of spring, and they are not equivalent. Groups one, two, and three are vadous, groups four and five hypogene. As the water flows away from the well, it cools, deposits some of its mineral contents, and mixes with the vadous surface water. Other substances in solution, notably the alkalies, are added to the world's stock of material. The Karlsbad springs bring up more than a million kilogrammes of new salt every year; the sea is not the provider but the consumer of salt, and the many remarkable similarities of composition in the waters of hot springs and of the sea become intelligible; the salts of the sea are now vadous, but they were once hypogene. But the atmosphere as well as the sea is enriched from hypogene sources. All the vast quantities of carbonic acid which issue from the soil at a hundred places, from here along the southern border of the Erzgebirge, and even farther to the east, are hypogene, and they are added to the contents of the atmosphere, except in so far as they are absorbed by vegetation.

We have been brought to the discussion of questions remote from the subject of my lecture. The hottest dry fumaroles, forming deposits of the ore by sublimation, the rain of hydrochloric acid from Vesuvius, and the salt of the Altensalza mines, the hot vapours which recently burned the bodies of the unfortunate victims at Martinique without setting fire to their clothes, and the warm healing waters which rise up here before our eyes, are members of one indivisible series of phenomena. The Earth is still giving off gases in a manner which may be compared to what we observe in the spots on the sun, or on every large mass of cooling steel.

GEOGRAPHY AT THE BRITISH ASSOCIATION, BELFAST, 1902.

The meetings of Section E of the British Association, under the presidency of Colonel Sir Thomas H. Holdich, R.E., C.B., K.C.I.E., were very successful, although the number of papers and reports, eighteen in all, was smaller than usual. In the importance and interest of the subjects there was no falling off, and the attendance was good, although the Geography Section was not accommodated in the main buildings of Queen's College along with the majority of the other sections, but in a large and convenient lecture-room connected with the Methodist Church.

The office-bearers of the section were the following :—

President: Sir Thomas H. Holdich, K.C.B., K.C.I.E., F.R.G.S. *Vice-Presidents:* Dr. H. O. Forbes; Dr. J. Scott Keltie; Dr. H. R. Mill, F.R.S.E.; Prof. J. Milne, F.R.S. *Secretaries:* G. G. Chisholm, M.A., B.SC. (*Recorder*); Edward Heawood, M.A.; Dr. A. J. Herbertson; Dr. J. A. Lindsay. *Committee:* Colonel E. Bailey, late R.E.; Mrs. Bent; John Bolton; W. S. Bruce; Colonel D. A. Johnston, R.E.; Prof. W. Libbey; Dr. F. Moreno; Miss Marion Newbigin, D.SC.; James Robinson, M.A.; Miss Ella Sykes; Major P. Molesworth Sykes.

The President's address, which was printed in the October number of the *Journal*, was a most valuable survey of geographical problems of moment from the point of view of the practical geographer. The papers were almost equally divided between accounts of little-known regions and discussions of special problems of distribution in selected areas, and it is most encouraging to find that in six cases the area chosen was within the British Isles. The proceedings at the Belfast Meeting bore witness to the welcome change which is taking place, in the interests of our geographers, from descriptive topography to scientific geography.

In a geographical journal it is more natural to group the papers according to their relations to space, and not in that of their sequence at the meeting. We shall follow the advice of most educational experts and begin with Ireland, the home of the Association this year, pass over the continents to the polar regions, and finally consider the great globe itself.

Meeting in Ireland, it was natural that several Irish papers should be read during the meeting. Some of these were not read in the Geographical Section. The general description of the geography of Ireland was combined with an account of its geology, and was given in the Geological, and not in the Geographical, Section by Prof. Grenville A. J. Cole. This was illustrated by magnificent lantern slides, many of them the work of Mr. Welch, that rare man the professional photography who has scientific interests. Mr. Welch's slides are, or ought to be, well known to all who have to teach geography. A similar description of the Belfast district was also given by Prof. Cole in the Geological Section.

Dr. Mill read a paper to the Engineering Section on "the Rainfall of Ireland," which he illustrated by maps showing the rainfall distribution for ten and for thirty years.

The botanical geography of Ireland was discussed by Mr. Lloyd Praeger, who dealt with it from the morphological rather than from the physical point of view, from statistics of species rather than from associations of plants. This is, of course, the most valuable method of going to work for the investigation of historical problems; the other is the more useful for the economic geographer. A full abstract of Mr. Praeger's paper will appear in the *Journal.*

Prof. Johnston, of Dublin, dealt with the peat question, which he has made his own. He showed a beautiful map of the distribution of peat-bogs in Ireland, which we should like to see reproduced on a smaller scale. He discussed the economic uses to which peat has been put, and illustrated his remarks with specimens. He pointed out that the bad name which peat-litter possesses in many quarters is due to its not being peat-litter. True peat-litter is composed of sphagnum, whereas the litter usually so called in commerce is largely composed of cotton grass, which does not possess the marvellous absorptive powers of the dried peat-moss. One of his statements must appeal to all students of economic geography. A company determined to utilize a peat-bog in the west of Ireland, and erected plant for making briquettes from peat. The briquettes were excellent, but, owing to the cost of freight, they could not be put upon the Dublin market at as low a price as coal from across the sea. From lack of consideration of the geographical-economical factors the company failed.

Another Irish official, the Rev. W. Spotswood Green, Chief Inspector of Fisheries, described the attempt made in 1896 to visit Rockall, an account of which will be found in the *Geographical Journal*, vol. ix. (1898), pp. 48–50. He showed a number of fine views of this sharks's tooth-shaped islet, on which birds alone seem to be able to alight, and pointed out its possible connection with islands marked on old charts. The nesting-place of the great spearwater was not seen, although the bird itself was.

The valleys of Southern Ireland have long been a puzzle. Jukes's classic memoir called attention to them, and his ingenious explanations of the consequent streams being beheaded have led, not merely to similar explanations of the drainage systems of other regions, but to vaster generalizations, which have had a most stimulating effect on both physical geographers and geologists, even on those who have assailed them most vigorously. Jukes's interpretation of the southern rivers of Ireland do not quite satisfy a student of the large-scale map, any more than Hull's hypothesis of conveniently situated fractures. Mr. Porter gave a vigorous account of these valleys, and showed a contour-map of County Cork made by him, a very necessary instrument in their study. He interpreted the transverse gorges across the west-east ridges of this part of the Armorican Highlands as due to glacial interference. The curiously right-angled courses of the tributaries of the longitudinal valleys he considered were the outcome of faulting and the torrential character of pre-glacial streams. A full abstract of his paper will appear in the *Journal*.

The consideration of the rivers of England from the point of view taken by Jukes in Southern Ireland has led Prof. Davis, and following him Mr. S. S. Buckman, to elaborate theories of a consequent drainage from the Welsh mountains to the south-east of England, which has been modified by the erosion along the softer Lias clays of the Avon-Severn valley. This has raised much controversy, which is by no means ended. Evidence of this diversion of drainage has been sought by Davis in the "misfits" of the present streams for their valleys (see *Geographical Journal*, vol. v., February, 1895, and the *Proceedings of the Geologists' Association*, vol. xvi., May, 1899). Dr. Herbertson, of Oxford, communicated a preliminary note on his studies of the Evenlode valley, one of Davis's consequent streams. He pointed out that, while he had no reason to doubt the reasonableness of Davis's general position, the misfit in the Evenlode windings could hardly be due to the diversion of a Welsh river to the Bristol channel, as the erosion of the Avon-Severn valley below the level of the present divide between it and that of the Evenlode was too great to be the equivalent of a mere shrinkage on the valley flow. Further, the configuration was complicated by a succession of levels, each of which required explanation, and of which all could not be due merely to differences of rock structure. The windings of the Evenlode, incised from 100 to 150 feet below the plateau level, must have been initiated at a greater elevation, when the stream flowed on the Oxford Clay, and not on the limestone. He also drew attention to a wide winding furrow from the Windrush valley, which joined the Evenlode above the most marked of the Evenlode meanders.

Prof. W. W. Watts treated of Charnwood forest as an old mountain region buried beneath Triassic deposits, above which the ancient mountain-crest crops out here and there. The paper, which was admirably illustrated, as befitted one by the secretary of the Geological Photographs Committee, will appear in full in the *Journal.*

Dr. T. N. Johnston sent an account of the work of the Pullar Memorial Survey of the Scottish lakes, which was read by Mr. Chisholm. Over one hundred lakes have now been surveyed, and a preliminary account of the work appeared in the *Scottish Geographical Magazine* for August, 1902. Curves were shown illustrative of the seiches which have been observed in some of the larger lakes (see Mr. Parsons' note in *Nature*, June 12, 1902).

Prof. Libbey, of Princetown University, New Jersey, greatly added to the interest of the meetings by giving three addresses on his investigations, two on his studies in Syria, and one on his expeditions to the arctic regions. All were illustrated by slides, which were skilfully chosen to exhibit points of scientific interest, and were of exceptionally fine technique and beauty.

In his paper on the Jordan valley, Libbey described a complicated series of transformations before the Syrian rift-furrow took its present shape. He considered that the first stage was the formation of a fault in the Cretaceous period, which marked out the line of the present furrow. A glacier then filled the valley as far south as the Sea of Galilee, and perhaps throughout its length. Depression followed, due to lateral pressure from the west, and 4000 feet of sediment were deposited as far north as the Sea of Galilee. A period of uplifting succeeded, during which 3000 feet of the sedimentary rocks were worn away. Then the glacier vanished, or the water-supply diminished, or the rate of elevation increased, or all three took place, and water ceased to flow over a local rising, which caused a hump at the present divide to the south of the Dead sea. Subsequently elevation through another 1000 feet occurred. The valley, then, is fundamentally due to fracture, but it owes much of its present configuration to erosion of ice, water, and wind.

From the Jordan valley Prof. Libbey showed a series of views which took the audience through narrow gorges, almost meeting overhead like the gorge of the Aar above Meiringen, to the wonderful depression of Petra, the rock city of Moab. He showed the Roman amphitheatre, where "the monarch and his minions and his dames viewed the games," surrounded by tombs and temples hewn out of the solid rock. As Mr. Chisholm pointed out, to hew a temple in the solid rock is really less difficult than first to quarry, then to chisel, and finally to fit together the masonry of a cathedral. Prof. Libbey showed that these rock temples cut in soft rock have resisted the "tooth of time," while the city proper has crumbled into dust, save for a single temple and a triumphal arch. He showed pictures of the "high places" of Moab, and of the panoramas seen from them.

Three other papers on parts of Asia were read by the Englishmen who know most about them. Major Sykes described Southern Persia, traversing practically the same ground as he did in his paper to the Royal Geographical Society (see *Journal*, vol. xix. p. 121).

Captain Ryder has spent two seasons surveying in Yünnan, being attached by the Government of India to a survey carried out by Major Davies for the Yünnan Company, with a view to definitely settling the Burma-China railway question. Captain Ryder will describe the results of his exploration at an early meeting of the Society.

Exploration seems to attract Cambridge men at present, and the latest to venture far afield is Mr. C. H. Hawes, who has recently visited Sakhalin and seen something of the interior of that little-known island and of its inhabitants. The Russians far outnumber the natives, and for most Englishmen Sakhalin, if known at all, is associated with the worst prisons in the Russian Empire. The island, however, is of intrinsic interest. It lies north of the volcanic zone, and is composed of Tertiary rocks, argillaceous sandstones, calcareous schists, and even coal, which is abundant in the west. It is 600 miles long, and may be compared in length and latitude with the distance between the Lake of Geneva and the mouth of the Elbe, although climatically it rather resembles the corresponding latitudes in eastern North America from Prince Edward island to the middle of Labrador.

Two other papers on Asia were read at other sections. Prof. Herdman gave an account to the Zoological Section of his recent expedition to the Indian ocean, and described by word and picture the ways of the pearl divers in the Gulf of Manaar. Dr. Henry presented a most valuable account of the Lolos of southern China to the Anthropological Section.

The only African paper, by Mr. R. B. Buckley, C.S.I., dealt with the economic geography of Uganda and the British East African Protectorate from the point of view of an engineer studying its possibilities, especially through irrigation. The prospects of great irrigation works do not seem to be very hopeful, for much of the region is deficient in rainfall. Mr. Buckley's paper will appear in the *Journal.*

Although polar exploration attracted most attention at the meeting, it may be dismissed very briefly here, as it is so fully dealt with in the *Journal.* Prof. Libbey read Sir Clement Markham's reassuring note about Captain Sverdrup, and for himself expressed every confidence in Peary. A few days later both were justified, for the explorers themselves notified their safety. Libbey's account of an expedition to carry supplies to Peary, and to attempt to relieve two young Norwegian explorers, was listened to by a crowded audience.

Dr. Mill gave an excellent summary of the different stages of antarctic exploration, illustrated by numerous well-selected lantern slides. We felt once more, as we watched how he carried every one with him through this long story, how very deplorable it is that Dr. Mill should have been permitted to give up the cultivation of the pecuniarily unfruitful fields of geography.

Mr. Bruce, leader of the Scottish Antarctic Expedition, showed views of the antarctic taken by him in 1892–93, and others made by him in the arctic, which illustrated the contrasts between the conditions of these opposite areas. As the *Scotia* could not be brought to Belfast in time, owing to the exceptionally heavy repairs constituting her practically a new vessel, he exhibited slides of the vessel and her chief fittings. He gave an outline of the proposed work of the expedition and of the personnel of the staff, upon which the account printed in last month's *Journal* (*q.v.*) was based.

The World-shaking earthquakes, in their relation to volcanic eruptions in the West Indies, were deftly handled by Prof. John Milne, whose account of them will be printed in an early number of the *Journal.*

The report of the Committee on terrestrial surface waves and wave-tide surfaces, prepared by Dr. Vaughan Cornish, was read. The main results have already appeared in different communications by the author to the *Journal.*

A number of excursions were arranged for the Saturday. One party started very early in the morning for the valley of the Boyne, another visited Rostrevor and Carlingford. Those who went to Newcastle and the Mourne mountains had a too full programme for the time. The coast road driving-party were enthusiastic about everything except the weather. The greatest number visited the Giant's Causeway, and found the arrangements made most excellent. A convenient little pamphlet was drawn up for each excursion by Mr. William Gray, the honorary secretary of the excursion committee. A more extended tour round the Antrim coast was carried out by some members after the close of the proceedings in Belfast.

In conclusion, a word of praise must be added for the compact 'Guide to Belfast and the Counties of Down and Antrim,' prepared by the Belfast Naturalists' Field Club, and edited by Messrs. F. J. Bigger, editor of the *Ulster Journal of Archæology;* R. Lloyd Praeger, editor of the *Irish Naturalist;* and John Vinycomb. It contains the following chapters: "Belfast Historical and Descriptive," by J. Vinycomb and A. Wilson; "Physical Features and Geology," by J. St. J. Phillips; "Botany," by H. Hanna, R. L. Praeger, and the Rev. C. H. Waddell; "Zoology," by G. H. Carpenter, J. N. Halbert, the Rev. W. F. Johnson, A. R. Nicholls, H. L. Orr, R. Patterson, R. L. Praeger, R. F. Scharff, R. Welch, and J. Wright; and "Antiquities," by F. J. Bigger and W. J. Fennell. The handbooks are often of the greatest value to the geographer, and the present one is among the best. It contains cuttings from Bartholomew's new $\frac{1}{4}$-inch contoured map, and of his $\frac{1}{10}$-inch geological map of Ireland, the latter map unfortunately not yet published for the whole island.

REVIEWS.

AFRICA.

SCIENTIFIC RESULTS OF CAPTAIN CH. LEMAIRE'S EXPEDITION IN CENTRAL AFRICA.*

OUR knowledge of the interior of Africa has made such rapid strides during recent years that it would be difficult to find a region of any extent that is now entirely unexplored, and the time has almost ceased to exist when a mere rough and ready route-sketch, furnished by a traveller who has little or no previous training in surveying, is likely to be of any real value. What is wanted now is something far more reliable than prismatic compass route-maps, and it is to be hoped that before many years lines of connected triangulation will be extended and carried across different parts of the continent, thus forming the basis of subsequent reliable surveys. Until this takes place, and when it is found impossible to carry out any system of triangulation, doubtless the best course to adopt for a journey of considerable length, and the survey work that is likely to give the most satisfactory results, is that of the character conducted recently by Captain Ch. Lemaire for the Congo Free State, from Lake Tanganyika along the Congo-Zambezi watershed, which depends for its accuracy upon positions fixed in latitude and longitude at frequent intervals by a large number of astronomical observations. A brief general account of the most important part of this journey was given in the *Geographical Journal* for February last, but this gave little idea of the amount of valuable observation and survey work performed by the expedition, to obtain which it is necessary to inspect the scientific report which has been prepared by Captain Lemaire, and recently published in sixteen parts, or "memoirs," as they are called. The first of these gives a general table of the results of the observations for latitude, longitude, altitude, magnetic declination, inclination, and horizontal intensity, taken at one hundred and ninety-five different stations along the route, and will be useful to cartographers and others for ordinary purposes of reference, although it should be stated at once that many of the altitudes here given have since been slightly modified, and a corrected table appears in the last part, No. 16, of the report which has lately been published. Preceding the general table of results in Part i. is an introductory chapter, setting forth very clearly the necessity for more accurate determinations of positions of places in this part of Central Africa, and giving an account of the method of observation and formulæ for computation employed. This chapter also gives a description, with illustrations, of the instruments used, of which the principal were as follows: (1) A meridian circle, or transit instrument, by Secrétan, Paris, of 56-millimètre (2·2 inches) aperture, 55 centimètres (21·65 inches) focal length, with nine vertical wires and reading upon the circle to 6″. With this instrument most of the latitude observations and the lunar culminations were taken, as well as the observations of the meridian passage of stars for rating the chronometers. (2) A transit theodolite, by Hurlimann, Paris, with 13-centimètre (5·1 inches) circles, reading to 30″ only, and fitted with long trough magnetic needles, of which four were taken. This instrument was used for secondary astronomical work, and for the determination of magnetic declinations. (3) Two marine chronometers, by Hohwü, Amsterdam, and a half-chronometer watch regulated to sidereal time, all of which appear to have given satisfaction. (4) A Delporte magnetometer, for the magnetic observations. (5) A George's mercurial barometer, by Cary, London, which was taken on the recommendation of Mr. J. Coles, the Society's late map curator and instructor in surveying. This instrument seems to have been previously unknown in Belgium, and as it appears to have answered Captain Lemaire's purpose well, and given good results, he devotes a considerable space to its description and use. The advantage of this form of mercurial barometer for the purposes of the explorer is that it is carried empty, and so much more safely than most other forms; but as considerable difficulty has often been experienced with the filling, especially on cold and exposed mountain-tops, it has lately rather fallen into disuse. However, the region over which Captain Lemaire passed was of no very great altitude, and as he evidently made himself thoroughly acquainted with the working of the instrument, and had it carefully tested before starting, it is not surprising that he obtained good results from it. In addition to the instruments already mentioned, there were two aneroids, a barograph, a hypsometrical apparatus, two pocket compasses, and two pedometers taken. A good telescope for observing occultations of stars might have been added with advantage.

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* 'Mission Scientifique du Ka-Tanga. Résultats des observations astronomique, magnitiques et altrimétriques.' Par le Capitaine Charles Lemaire, du 2^{me} Régiment d'Artillerie, chief de la Mission. Publications de l'État Indépendent du Congo.

Parts Nos. ii. to xv. contain, at the commencement, one or two pages of tabulated results, as in the first part, and then in the remaining pages of each an explanation of the observations and the computations upon which the results are based, the stars employed, the result arrived at from each separate observation, how far the results differ from one another and from the means adopted, and other matters that will be most interesting and useful to those who wish for further details than can be obtained from the general table of results. It is thus possible to judge of the relative value of the observations, and the amount of reliance to be placed upon them. For instance, it will be seen that the latitudes are arrived at from the mean of meridian zenith distances of stars taken north and south of the observer, and in some cases as many as twelve to twenty stars have been observed. In many instances the agreement between the separate observations and the results of the pairs is fairly good, but in others the differences are decidedly large, considering the size and character of the instrument generally employed.

As regards longitude, sixteen of the stations were fixed by the absolute method of lunar culminations observed with the transit instrument, which had been previously placed in the meridian, and the remainder by ordinary chronometric differences, the chronometers and half-chronometer watches being carefully rated. The observations and results of the computations for the rating are all tabulated in these memoirs. It is surprising that the longitudes were not determined by occultations of stars wherever this was possible, for this observation has from experience been found to give the most satisfactory results of all absolute methods, and certainly might have been employed with advantage in conjunction with the lunar culmination method, as might also the usual moon-culminating star observation. However, as the mean of a considerable number of observations has been taken, it is possible that the resulting longitudes are not very much in error.

The last part, Memoir No. xvi., is entirely devoted to the determination of the altitudes, and, as previously stated, gives a revised table of results for all those observations taken between the months of August, 1898, and May, 1900. The difference between the figures given in this table and those which previously appear is generally very slight, but upon further consideration it has been thought necessary to apply a small correction. The altitudes were determined by the George's barometer and aneroids, checked by boiling-point thermometer-readings, no attempt being made at trigonometrical determinations. However, as care has evidently been taken with the readings and computations, and no great elevations were met with, the results ought to be very fairly correct. The formulæ employed in the computations of the altitudes are given. The first section of this latest published memoir, the substance of which was communicated to the *Société Belge d'Astronomie* at the meeting held on December 2, 1901, consists of a most interesting general discussion on the subject of the determination of altitudes, especially with reference to tropical Africa, and is accompanied by diagrams and tables showing the mean annual range of the barometer and thermometer at Daar-es-Salam, Kwai, Banana, and St. Paul de Loanda, as well as the variation for each month. Captain Lemaire comes to the conclusion that, as the variation of the barometer readings at sea-level in tropical Africa is so slight, and such changes as exist so regular and similar in places separated by great distances, it is possible to construct a table for tropical Africa upon the principle of that arranged by Delporte, with certain modifications, which shall give the altitude corresponding to any observed reading of the barometer and thermometer at a glance with sufficient accuracy for all practical purposes, having first allowed a correction for daily range, and thence obtained the mean annual reading for the place from tables which are given. At the end of the last part this general table for the determination of altitudes is given, and certainly a considerable saving of time and labour would be effected by its use, but the results can only be considered approximate, and for accurate work there is no doubt that the altitudes should be computed.

A map, showing the geographical results of Captain Lemaire's expedition on the scale of 1: 1,000,000 (in two sheets), has already been published, but a complete atlas in 125 to 130 sheets, on the scale of 1: 50,000, showing all details, is to appear in three parts, during this year and next. The first 28 sheets of this atlas were published a few weeks ago. E. A. R.

AGAIN THE OPHIR QUESTION.*

During his two years' travels (1899–1901) in the region south of the lower Zambezi, Dr. Peters, late of the German Colonial Service, visited several districts about the Anglo-Portuguese frontiers, with the twofold object of inquiring into their mineral resources on behalf of a London syndicate, and of making any fresh discoveries that might help to elucidate the perennial Ophir question. The results of both inquiries, with much additional matter dealing with the geographical features, climate, and ethnology of the parts visited, and the present economic relations and future prospects of the whole land between the Zambezi and the Limpopo, are embodied in this bulky and well-illustrated volume, which thus appeals to many tastes and many interests. Exploring work, with which we are here mainly concerned, was confined to Macombe's semi-independent territory in the Muïra valley below the Lupata gorge, the Rhodesian districts of Inyanga in the Ruenya basin, and Melsetter in the upper Sabi valley, and the intervening Portuguese province of Manica. From one of the accompanying maps, showing the routes followed through these tracts, it is at once seen that they comprise just those parts of the country which have been least, or not at all, included in the researches of the author's forerunners, Mauch, Bent, Baines, Hall, Neal, Johnson, and White. Hence our author's investigations are all the more welcome, since, as far as they go, they serve to complete the preliminary archæological survey of the whole region between the Transvaal and North Rhodesia—that is, the region of the Zimbabwes, terraces, chains of forts, slave-pits, gold and copper workings, and other remains of the old Himyaritic and Phœnician treasure-seekers.

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* 'The Eldorado of the Ancients.' By Dr. Carl Peters. 2 maps and 97 illustrations. Pearson: 1902.

The sum of these remains is not greatly increased by Dr. Peters' contributions, since little was found in the Muïra valley, and Manica was merely traversed, while the remarkable terraces of Inyanga were already known from Messrs. Hall and Neal's book, reviewed in the *Journal* for April, 1902. In fact, his chief discovery was the extensive copper-workings of Melsetter, extending over a distance of 25 miles, and associated with ruins of the Zimbabwe type. These are regarded as "the necessary complement to the gold-mines of Mashona- and Manica-lands." Yet, while the gold-workings and monuments are rightly assigned to the Semitic Himyarites, it is suggested that the Hamitic "Egyptians obtained the copper of their voyages to Punt" from the Melsetter mines. To understand this allusion, it should be stated that Dr. Peters, following the dangerous guidance of Dr. Glaser, gives a prodigious extension to the Egyptian Punt, which is made to embrace not only Yemen and Somali-land, but also Æthiopia, "with the Abasian colonies that extended beyond the Victoria Nyanza, the Azanian colonies, along the Zanzibar coast, the Sabæan dominions between the Zambesi and the Sabi, with Mashona-land and Manica, and doubtless Madagascar. All this was known to the Egyptians, and to the Egyptians only, as Punt." It follows that the Egyptians could go nowhere without going to Punt, so that the word becomes meaningless as a determinant of any particular expedition. But the Egyptian theory is supported by the Egyptian statuette, of which so much has been heard, and which is here again brought forward to fix the very spot near Tete on the Zambezi where the governor appointed by the Pharaoh "appears to have died and to have been buried." Yet Dr. Peters complains that in 'The Gold of Ophir' I make him aver that South Africa was "an ancient Egyptian settlement." I did so because he had already written to the *Times* (August 1, 1901) "that these mining districts were originally discovered by the Egyptians, *and were an Egyptian colony.*"

However, despite all these Egyptian velleities, he frankly allows that "the mass of South African ruins is of ancient Semitic origin," and even claims to have always thought so "ever since Bent's expeditions." Thus the only real difference between us is that, while I hold Rhodesia to be the source, and Ophir the distributor, of the Solomonic gold, Dr. Peters thinks that Rhodesia was Ophir itself, that is, both the source and the distributor. In support of his contention he unfortunately revives some of his already discredited etymologies, such as Ophir = Afer = Africa, and also introduces others of an equally reckless character. Thus, "In the word '*Pun*-gwe' I recognize one of the philological evidences that this region once belonged to the Carthaginian [*sic*] dominions on the Indian Ocean specially indicated by Dr. Glaser, and called by the Egyptians Poenat, or Punt."

But it may be pointed out that the Carthaginians owned no land in the Indian ocean, and that here *Pung* is not *Punt*, but the root of the Bantu word *pungula*, "to pour out, to overflow," as the river in question does during the monsoons. So also the quite recent *Gaza* of Gazaland is the *Gaza* of Palestine; the Latin *Gallina afra* means "Ophir-hen," which "makes it a likely supposition that the guinea-fowl was known to the Carthaginians as the Ophir-fowl, and through these to the Romans." Then the M. *Fura* of an old French map becomes *Afur*, *Africa*, *Ophir*, but also "a mine," so that Ophir means both a whole continent and its underground treasures. Fura, however, I understand, locally means "water," whence, perhaps, Dr. Peters' failure, after a long quest, to rediscover "la grande montagne de Fura" of the French map. Lastly, the Punic migrations are carried beyond the Victoria Nyanza and Tanganyika to the upper Congo, where the ruling tribe of the "Ba-ima or Ba-'m is perhaps a corruption of Ba-Ma'in," the South Arabian Minæans. But the Ba-ima are the well-known Ba-Huma of Galla stock, who, like the late King Mtesa of Uganda, still often speak Galla, which is not a Minæan (Semitic) but a Hamitic language. To find any parallels to these strange etymologies, we must go back to the Phœnician king *Achis* of Gath, identified by Hitzig with the Homeric *Anchises*, father of Æneas by Venus; or Büttner's equation of the *zzar* in Nebuchadnezzar with the Russian *Tsar* (Cæsar). Dr. Peters may perhaps claim that he errs in good company, but not that he has advanced the Ophir question by these etymological vagarics.

A. H. KEANE.

AMERICA.

PERUVIAN ANTIQUITIES.*

Herr A. Baessler, of Berlin, has lately returned from South America with perhaps the most extensive collection of old Peruvian industrial and artistic remains ever brought together by any single explorer in this apparently inexhaustible storehouse of American antiquities. The finds, numbering altogether over 11,500, were partly obtained by his own researches amid the pre-Columbian graves strewn over the Andean uplands, and partly by purchase from other collectors, amongst whom Mr. W. Gretzer, of Lima, calls for special mention. Everything has now been deposited in the Berlin Royal Museum of Ethnology, and from these rich materials Herr Baessler has made a selection for reproduction, with descriptive text, in a sumptuous work of four folio volumes, comprising 165 plain and coloured plates, with nearly 500 separate figures.

The work will be issued in fifteen parts, each consisting of eleven plates in portfolio, with accompanying explanatory text; and arrangements have been made for the completion of the whole within the year 1903. Vols. i. to iii. (Plates 1 to 130) will be occupied with the drawings and paintings, the scenes shown in relief and on the round, on North Peruvian earthenware, and will include specimens of ornamental motives, houses and temple pyramids, battle and festive scenes, social gatherings, mythical beings human and animal, inhabitants of the upper and underground worlds, and numerous other subjects illustrating the political and social relations, the religious and mental notions of pre-Columbian times. In vol. iv. (Plates 131–165) will be reproduced various pictorial scenes on earthenware from the central Pachacamac district, together with several specially selected specimens from all parts of the empire of the Incas. Amongst these and the other objects chosen for comparative purposes are comprised crowns and sceptres, weights and scales, banners, bronzes, gold and silver vases, surgical instruments and dressing appliances, mummy-packs, feather-work, and such like characteristic specimens of the ancient Peruvian industrial arts. Reserving a detailed notice till the completion of the work, it will suffice here to state that, judging from Part i. already issued, 'Ancient Peruvian Art' promises to take its place, jointly with Reiss and Stübel's 'Necropolis of Ancon' and Tschudi's 'Historical and Linguistic Studies,' amongst the most indispensable contributions to our knowledge of the social life and general culture of the more advanced peoples of the New World. As was to be expected, Professor Keane's rendering of the German explanatory text is accurate, intelligent, and idiomatic.

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* 'Ancient Peruvian Art: Contributions to the Archæology of the Empire of the Incas. Made from his collections by Arthur Baessler; translated by A. H. Keane. Part I. Asher: 1902.

THE AMAZON.*

The river Aquiri, or Acre, the principal tributary of the Purus, which is one of the main southern affluents of the Amazons, was first discovered in 1865 by our Gold Medallist, William Chandless, who thoroughly explored its course so far as it was navigable, and gave a most interesting account of its banks, their products, and inhabitants. He fixed twenty points by astronomical observations, and made a detailed map of the river (see *R.G.S. Journal*, vol. xxxvi. p. 119). Mr. Chandless reported that indiarubber trees of good size and quality were fairly common.

It appears that fifteen years after the discovery by Chandless, a number of colonists from the arid Brazilian province of Çeara arrived in the Acre, and established themselves at various points to work at the indiarubber industry. But the river is on the Bolivian side of the boundary agreed to between Brazil and Bolivia in 1867, and in January, 1899, Dr. Don José Paravicini, a Bolivian diplomatist, arrived in a river-steamer to establish a port which he named Port Acre. The river is here 70 yards broad, with impenetrable forest on its banks. In the following July the Brazilian settlers declared their independence, and elected a President, expelling the Bolivian garrison. In January, 1900, the Bolivians, under one Ibarra, arrived at Port Acre, but were repulsed, and their leader was mortally wounded.

A more important expedition was then organized in Bolivia, to restore order in the Acre region. It consisted of a force of 270 soldiers, under Colonel Ismael Montes, which left La Paz in June, 1900. The present work is a narrative of the proceedings of this expedition written by Don José Aguirre Acha, who accompanied it. The Brazilian Government remained neutral. The march was partly through dense forest, and the Bolivians appear to have encountered no ordinary difficulties. On reaching the river, there were several actions and some loss of life; but by January, 1901, the resistance of the Brazilian insurgents was overcome and peace was restored. Port Acre became the seat of government, the blockade was raised, and the export of indiarubber was recommenced. The Bolivians were wise in thus enforcing their sovereignty, for it is likely that in the near future Acre will become an important centre of the indiarubber trade.

In the last chapter there is an account of the steam navigation on the Amazons, and some interesting statistics.

C. R. M.

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* 'De las Andes al Amazonas Recuerdos de la campaña de Acre.' Por José Aguirre Acha. Pp. ix. and 273. La Paz: 1902.

THE MONTHLY RECORD.

EUROPE.

The Thames-Severn Divide Controversy.—Mr. Strahan, in a recent paper on the "Origin of the River System of South Wales, and its Connection with that of the Severn and the Thames" (see *Quart. Jour. Geological Soc.*, May, 1902, and note in *Geographical Journal* for July), asserted that the course of the Severn parallel to the Cotswold escarpment remained unexplained, and that "the theories put forward by Mr. S. S. Buckman, . . . following the lead of Prof. W. M. Davis," appeared to him "to transgress the limits of legitimate speculation." Mr. Buckman sends a vigorous reply to the August number of the *Geological Magazine.* Mr. Strahan's contention is that when the chalk covered the whole region, an anticline in a S.W.-N.E. direction (which he, Mr. Buckman, and others call Caledonian, to the confusion of our nomenclature) existed about the position of the present Thames-Severn divide, and accounts for the westerly deflection of the Severn. In support of this hypothesis, he stated that Mr. Buckman had recently found traces of an anticline in the vale of Moreton which might confirm his supposition. Mr. Buckman points out that the Moreton anticline has a N.-S. (so-called Malvernian) trend, and therefore has not the direction which Mr. Strahan requires; and, further, "it is not in the position that he wants, it is not where he has marked it on his map, and it does not coincide with the water-parting." If such an anticline as Mr. Strahan imagines existed, the Jurassic rocks would dip differently than they do west of the present escarpment; but the Jurassic rocks of the Severn valley dip persistently to the south-east, as do those of the Cotswolds. Moreover, "the tributaries on the left bank of the Severn-Avon have not the direction which his hypothesis requires; but they flow more or less against the direction of the Severn and Avon; . . . they diverge towards the main stream." This might be explained by radial drainage of a dome-like elevation, of which there is no trace here, or else by the hypothesis that the "tributaries of the Severn-Avon have worked back in and now occupy valleys which were originally marked out by streams that flowed in the opposite direction, namely, with the dip, before the Severn valley had been made, and these streams converged to join the Thames river system." Mr. Buckman asserts that this is the theory which Mr. Strahan declares passes the bounds of legitimate speculation. We imagine that Mr. Buckman's suggestive but very hypothetical map, rather than Mr. Buckman's or Prof. Davis's papers, were in Mr. Strahan's mind when he penned his somewhat malicious strictures. The most suggestive part of Mr. Buckman's paper is not its destructive criticism, but the working out of the drainage lines resulting from the intersection of a south-dipping N.-S. and an east-dipping W.-E. (so-called Malvernian and Armorican) anticlinal axis. From the east of the south-dipping Welsh backbone the streams would run obliquely, *i.e.* south-east, or at right angles to the S.W.-N.E. strike. From the north of the east-dipping Mendip-Pewsey axis, the streams would run north-eastwards. The two series of dip-streams would meet in the synclinal trough, the Kennet-Thames trough. The next stage is the differential denudation on the older rocks after the surface covering has been worn away, when strike streams develop in the softer outcrops, and their growth results in river captures. In the third stage, rivers working back against the dip are started in the valleys of beheaded dip-streams; so breached escarpments with valley water-partings are formed. Mr. Buckman maintains that this is a more rational theory, and one whose principles can be applied to all river-systems, whereas Mr. Strahan's only meets an isolated case, or requires an anticline to account for every strike-stream and for every water-parting which happens to coincide with an escarpment.

Prehistoric Man and the Glacial Epoch in the Alps.—Prof. Penck, of Vienna, lectured to the recent congress of naturalists and physicians at Karlsbad on the glacial epoch in the Alps and its relation to prehistoric Man. He described the results of researches by Prof. Brückner and himself, showing that the glacial period in the Alps was characterized by major and minor variations of climate. Four distinct glacial periods have been recognized, separated by three interglacial intervals, and after the last ice period three glacial "stages." Bringing this time-succession into relation with the traces of prehistoric man, it appears that the latest prehistoric records are later than the last of the glacial "stages," while the older stone periods coincide with the glacial period proper. The latest section of the older stone periods, the Magdalenian, is later than the last ice period, but the Mousterian is older than it, corresponding to the last interglacial period. The oldest division of palæolithic time corresponds to one of the two interglacial periods. Hence it follows that de Mortillet's division of palæolithic time, based on the evidence of progressive improvement in stone implements, really separates from one another different phases of a development which was spread over a long time, and that the older stone age was incomparably longer than the more recent. The stone age included the greater part of the glacial epoch, the duration of which must have been at least 500,000 years. It appears, further, that the interval between the older and the more recent stone periods must have been of but short duration; indeed, new finds tend to fill up this interval more and more. Henceforth we must think of an advance of neolithic culture rather than of an immigration of neolithic peoples, and, in the light of modern knowledge, must regard Europe as the scene of an ancient civilization which had its beginnings several thousand centuries ago.

Results of Boring in the Hintereisferner (Tirol).—The problem of piercing a glacier by means of boring has at last been solved, with results of undoubted scientific interest. During August last the Bavarian scientists Blümcke and Hess succeeded in making a number of borings in the Hintereisferner, in the Ötzthaler Alps, above Vent. At a distance of about one and a quarter mile from the tip of the glacier, where its breadth is 2130 feet, and the height of its surface above sea-level 8530 feet, a boring in the middle reached the rock at a depth of 500 feet. The apparatus employed was similar to that used in mines for trial borings; it was worked by hand, and had special arrangements for washing out the borings with water so as to prevent their freezing in again. The formation of cracks and fissures seriously interfered with the washing out, but the difficulty was got over by lining the upper 80 feet of the bore with steel tubes. Taken along with measurements of rate of movement, surface melting, and temperature observations, the boring operations have enabled the following conclusions to be drawn: (1) The temperature of the ice is at the melting-point throughout the whole mass of the tongue of the glacier; (2) the bed of the glacier is trough-shaped; and (3) the ice moves more slowly along the bottom than at the surface. The last fact, now definitely established by direct observation, has been disputed by E. von Drygalski. The bore-holes were, as formerly, filled up with pieces of wood, which will serve for many years to come as measures of the rates of movement and surface melting. The cost of the work has been borne by the German and Austrian Alpenverein.

Geological Structure of Sardinia.—Prof. A. Tornquist, of Strassburg, has lately undertaken a journey of geological research in the Western Mediterranean, with the support of the Prussian Academy of Sciences. The region first visited was the island of Sardinia, of the geology of which our knowledge has hitherto been very imperfect, and the preliminary results of the journey were put before the Academy at its meeting of July 10 last (*Sitzungsberichte*, vol. 35, p. 808

et seq.). Prof. Tornquist's primary object was the investigation of the Trias of the Western Mediterranean, and as this formation had been reported to exist in four different parts of Sardinia, he was led to visit the greater part of the island, and was able to collect data on its general geological structure. The Trias was found to be less extensively developed than had been supposed, being present only on the west side of the island, in the Iglesiente, and its natural continuation, the Nurra di Sassari. As in Central Europe, the alpine and extra-alpine facies of the Trias are divided in this region by a broad zone, which follows the major axis of Sardinia, passing northwards towards the west side of Corsica, where the alpine facies, absent in the larger island, occurs in the east. From a structural point of view, Western Sardinia shows an equal contrast with the centre and east, being the only part in which the cretaceous system of folds is developed. Between the two regions there is a zone of depression, in which the traces of recent volcanic action are localized. The structure of the island thus forms a striking example of the way in which one and the same zone has served, ever since palæozoic times, to separate regions of entirely different geological action. It also presents many analogies with the geological conditions of Central Europe, the central zone corresponding in many ways with the tableland of Switzerland and Southern Bavaria, whilst the western folded range is homologous with the folded Jura in Central Europe.

Glaciated and Non-glaciated Regions in Russia.—The contrast between the topography of the glaciated and non-glaciated regions in Russia is perhaps best studied in the Volga heights, the eastern half of which has not been covered with ice. Mr. Bertrand gives a brief account of this region in the *Bull. de la Soc. Belge de Géol.*, vol. 15, 1901. He sees in the gradual rise of level from 190 metres in the north to 200 metres in the south of the western glaciated region evidence for the thinning of, and consequently for diminished erosion under, the ice-sheet; for in the non-glaciated east the highest point (250 metres) lies halfway between north and south and decreases in the direction of the valley-lines. In the east, Tertiary deposits exist on the top of the heights, are thickest at the centre, thin off towards the periphery, and are completely worn away in the valley. From the western part the Tertiary rocks have disappeared, except in the extreme east and south-east. Along the Isna valley, the axis of the Oka-Don ice-flow, erosion has been greatest, and on the margins and at the end it has been least, where the ice was thinnest and covered the ground for the shortest time.

Kertch and the Azov Trade.—The difficulties of the Kertch straits have always affected the trade of the Sea of Azov, and the report of the British Consul at that town calls attention to the various projects now under consideration for the improvement of the present condition of affairs. One plan is for the dredging of the straits to a uniform depth of 25 feet, and the construction of ports capable of receiving ocean-going steamers at the various towns in the Azov sea, by which means ships could be able to load a full cargo at Taganrog, Mariupol, etc., and pass through Kertch straits without stopping. Another project would cease dredging the straits altogether, making Kertch an extensive deep-water port of the first class, and carrying on the sea of Azov trade by means of smaller coasting vessels. The first plan, it is stated, would necessitate enormous outlay, with constant expense for dredging. The latter would be the more feasible, and though at present Kertch has no accommodation for shipping, there is no reason why it should not become one of the most important towns in South Russia. It possesses an unlimited quantity of rich iron ore, and salt lakes capable of turning out 50,000 tons yearly, in addition to rich fisheries and oyster-beds, and recently powerful naphtha springs have been discovered. Another project which has been set on foot is one for the closing of the straits by means of a dam with locks, so as to raise the level of the sea of Azov and make it accessible for larger vessels.

The Forests of Rumania.—The increasing export of timber from Galatz, due to the action of the Rumanian Government in reducing the railway tariffs for the conveyance of wood, is remarkable. The timber trade has now practically deserted Odessa for this port, and nearly 319,000 tons were exported last year. The forests of Roumania cover about one-sixth of the total area of the country, and reach a total of some 7,000,000 acres, of which about one-half is owned by the State and by public establishments and communes, and the rest by private individuals. Of the different forests, those of beech are the most valuable, followed by those of the various kinds of oak. From the latter were obtained the sleepers for the Congo railways. After these in relative degree of value come pitch pine, fir, lime, elm, ash, and plane. The consular report (Annual Ser., No. 2874, 1902) states that, while the forests of the peasant proprietors and small holders have been practically destroyed by wholesale cutting, those of the State are in good condition and are now managed with care.

ASIA.

Scientific Results of Dr. Sven Hedin's Last Expedition.—A letter has been addressed by Dr. Sven Hedin to the King of Sweden, in which the traveller submits a proposal for the publication of the scientific results of his latest expedition under the auspices of the Swedish Government, a proposal which, it is hoped, will be received favourably. After summarizing the geographical and other work accomplished during the last three years, and quoting opinions which have been expressed in the *Journal* and elsewhere, as to the importance of the publication in full of the extensive material collected, Dr. Hedin develops his plan as follows: "The cartographical material should be worked up at the Lithographical Department of the General Staff in Stockholm, under the supervision of Captain H. Byström and myself. It should be reduced to the scale of 1 : 200,000, and be published in an atlas of two volumes containing 100 sheets of large size, with introduction, letterpress to each sheet, and astronomical points. According to an estimate made at the G.L.A., this atlas would involve an expenditure of 40,000 kr. (about £2200). The cost of working through the meteorological journals and of their publication, with the necessary charts of atmospheric pressure over the interior of Asia, is reckoned by Dr. Nils Ekholm at 5000 kr. (£280), including the expense of copying contemporary observations recorded at several stations in South Siberia and Northern India, fees to assistants, providing an instrument for transferring barogram and thermogram records to tables, etc. The 113 series of astronomical observations to determine points will demand for reduction and publication a sum of 3000 kr. (£166), according to Prof. P. J. Rosén. The zoological, botanical, and archæological reports will require 2000 kr. (£110) each, according to the estimate of Profs. Leche and Lagerheim, and the sinologist, K. Himly, of Wiesbaden. The geological work will, H. Bäckström states, require 15 sheets of text, 10 plates, and 2 geological maps, and will cost 5000 kr. There remains the purely geographical report, which I have myself reckoned out at 100 sheets of text, with 30 coloured maps (not included in the atlas), and 500 illustrations in the text. It will cost 1600 kr. (£890) to publish. Hence it appears that the publication will altogether entail an expenditure of 75,000 kr. (about £4170). Evidently, in consequence of the heavy expense and the small sale that may be expected of a purely scientific work, no private publisher can undertake the publication. . . . The popular narrative of travel I am in the mean time preparing for publication will doubtless procure me a return, but I would at the same time point out that my expedition in Asia cost me personally 40,000 kr., in addition to the liberal contributions I received from your Majesty, as well as from Swedes interested in geographical exploration, especially E. Nobel. Under these circumstances, and knowing the liberality with which the Government and Parliament support Swedish research, I venture humbly to entreat that your Majesty will graciously submit to the Parliament now about to meet a proposal to grant a subsidy for the publication of the scientific results amounting to 75,000 kr., to be spread over three years, commencing with the year 1903."

Dr. and Mrs. Workman in the Karakoram.*—Dr. William Hunter Workman and Mrs. Fanny Bullock Workman have returned to India after their third expedition among the higher Karakoram mountains. They devoted their attention chiefly to the Chogo Lungma glacier, which they explored throughout its entire length, from Arandu to its point of origin some 30 miles to the north-west. They also explored three large tributary terminal glaciers, which are important feeders of the main trunk. Some forty years ago Colonel H. H. Godwin Austen surveyed the lower part of the Chogo Lungma, but the upper part has never before been visited, and the map at this part was found wholly incorrect. The Chogo Lungma takes its rise in a steep snow wall or col about 20,000 feet in altitude, which connects two lofty peaks, one of which is fixed by the Indian Survey at 24,486 feet, and the other cannot be much lower. Several other magnificent peaks of nearly the same altitude send down large glaciers to help form the Chogo Lungma. One of the tributary glaciers brought the explorers under the northern flank of Mount Haramosh (24,285 feet), to a broad snow-pass at a height of 17,500 feet, from which another glacier plunges sharply down to the west into a deep valley, whence, by crossing a lower ridge at 15,000 feet, Gilgit can be reached. This pass could never have any military importance, as it and its approaches lie in a region in the highest degree alpine, which no army could ever cross. The surface of the Chogo Lungma is irregular, being at some points considerably depressed, and at others much raised above the general level. It is in many places seamed by crevasses extending in all directions, and the resulting *séracs*, some of them of vast dimensions with their environing abysses, form labyrinths through which a path is extremely difficult to find. The tributary glaciers are nearly all broken at different places in their course into impassable ice-falls. The Chogo Lungma has evidently receded greatly in recent years, both at the snout and along its course. For long distances vast lateral moraines tower far above the present level of the ice, completely shutting out all view of it from one walking along the bases of the mountains that skirt the glacier. The glacier bears large medial moraines in places 80 to 100 feet high, which enter it from the terminal branches. At the entrance of the Haramosh arm a deep depression in the surface is occupied by a good-sized lake. Much soft snow was encountered at the upper parts near the origin of the main glacier and those of its branches. The depth at one place measured 85 centimetres (2 feet 9 inches), which was about the average depth over a considerable distance. Many days and nights were passed at snow camps at altitudes of from 16,000 to over 19,000 feet. Four peaks and two cols were ascended. Several rock cairns were built at points where materials were to be had, in which records were deposited. The weather was unfavourable for mountain work, being uncertain or stormy most of the time. The party was detained at one high camp for sixty hours by a severe snowstorm. Thanks are due to the British authorities at Srinagar for their courteous aid in obtaining transport, and also to H.H. the Maharaja of Kashmir and his brother Sir Amar Singh, who took a most friendly interest in the expedition, and issued orders to all officials along the route to promptly furnish coolies and supplies, and render any other assistance needful. A large number of photographs were taken. Dr. Karl Oestreich, of Frankfurt, accompanied the expedition as topographer, and Mattia Zurbriggen and Müller Giuseppe as guides. Most of the altitudes given above are to be regarded as only approximate, subject to correction when comparison shall have been made with the readings at the lower station.

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* Communicated by Dr. W. Hunter Workman.

The Saposhnikof-Friederichsen Expedition to the Tian Shan.—We have been favoured by the Hamburg Geographical Society with a copy of a letter addressed to the Society by Dr. Max Friederischsen, announcing the return to Lepzinsk, in the Semiretchesk Government, of the expedition to the Tian Shan undertaken by him, as announced in the *Journal* for June last, in company with the Russian botanist Saposhnikof. Although attended with some dangers and hardships, the expedition had been most successful from a scientific point of view, valuable results having been obtained, not only in the Tian Shan itself, but during the return journey from Charkent through the Dzungarian Alatau, many of the valleys in which had never before been scientifically explored. Dr. Friederichsen's route survey and the theodolite observations, determinations of altitude and photographs taken by the expedition, will supply entirely new material respecting the morphology of the range. During this part of the journey bad weather, with snowfalls and nightly frosts, was experienced, and caused the travellers much discomfort in the tents which were their only shelters. An attack was made upon the party by nomad Kirghiz, but friendship was soon established. At the date of writing (August 29), Dr. Friederichsen was about to start with his Russian companion *viâ* Sergiopol for Kakpekti, in order to examine a mammoth *in situ*, and was then to proceed *viâ* Semipalatinsk to Omsk, where he expected to make some stay, returning to Europe early in October.

Recent Progress in Formosa.—The Rev. W. Campbell, who for many years has worked as a missionary in Formosa, sends us some notes on the additions to our knowledge of the island and the improvements in its material welfare, which have been made under Japanese administration. From the latter point of view, much has been done in the construction of roads, tramways, and railways, and the establishment of stations for administrative and scientific purposes. These improvements were preceded by detailed inquiries regarding the population and topography of the island. The work of the census alone occupied about two years, and the resulting information has been stored up in government publications of much value. Maps of the island have been prepared, one on the scale of 1:200,000, based on the British Admiralty chart, but giving both a fuller delineation of the coast-line and many additional details respecting the interior; the other, on half the scale (1:400,000 or 6·3 stat. miles to the inch), but even fuller, and only to be replaced when the labours of the present survey commission are completed, about three years hence. Scientific contributions to our knowledge of Formosa have been made by Prof. Honda, whose expedition to Mount Morrison* in 1896 was described in the *Journal* for January, 1898 (vol. xi. p. 68), by Dr. Ishii, whose geological papers in the *Journal* of the Tokyo Geographical Society have shed a flood of light on the physical geography and river systems of Formosa; and by Mr. Miyake, whose botanical collections include 23,000 specimens, many of them from the seldom-visited island of Botel Tobago. Mention should also be made of the *Monthly Journal* of the Formosan Association, which is a mine of trustworthy information on everything relating to the island. It is only to be regretted, Mr. Campbell says, that so many of these substantial contributions to the general stock of knowledge should be available only to those familiar with the written form of the Japanese language, and the establishment by the Government of a small translation bureau is very desirable. Lastly, one of the many important undertakings for which outsiders are indebted to Japan is the lighthouse now nearing completion on North island of the Pescadores group, in the neighbourhood of which there have been about thirty wrecks within as many years, including that of the P. and O. liner *Bokhara* in 1892. Mr. Campbell concludes with some remarks on the need for reform in the methods in use for the writing of native names in Roman letters, in regard to which things are constantly drifting into worse confusion. European writers, *e.g.*, often spell the names, not as they are locally pronounced, but according to the sounds of the so-called mandarin dialect. Thus the British Admiralty chart has Fung-Shau for Hong-Soa, Pong-hou for Phe-aw, etc., etc. On the other hand, the missionaries have prepared an extensive literature in Roman letters for the ten millions of people who speak the same form of Chinese in Formosa and the opposite mainland, every form of local speech being represented by the use of tonal and other diacritic marks; while the Japanese educational and telegraph departments both employ divergent methods from either of the above, and have also replaced many of the native names by Japanese ones. The requirements of the case seem to be as follows: The correct pronunciation, as seen in Roman letter-books in use among the natives, must be taken as the basis; but for all outside purposes a simple method of spelling, in which redundant letters and unusual signs are omitted, should be adopted. Tables should be drawn up showing the two spellings of each name side by side. Attention to the R.G.S. rules on the subject of place-names would both add to the convenience of the people, and would eliminate mistakes and enable westerners to follow the course of events in the island with much more intelligence.

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* So named by the late Captain Collinson after the pioneer Protestant missionary to China (*vide P.R.G.S.*, vol. viii., 1864, p. 25).

Railway Development in Formosa.—The projected main line which is to extend from Kelung to the south of the island of Formosa is progressing rapidly. Of the northern section, 63 miles are already completed, the considerable town of Shinchiku being now reached. In the south the line from Takou has been finished, and is open for traffic as far north as Kagi, a distance of 67 miles, and Tarimu, some 15 miles further north, will be reached by the end of the year, by which time another 21 miles will be added from Shinchiku. This makes a total of 166 miles, and another small line of 13 miles in length connects Tamsui with the capital Taipe, or, as it is now called, Taihoku. The nomenclature of other places has been changed, and Twatutia, the chief resort of the foreign merchants, is now known as Daidotei (F.O. Reports, Annual No. 2869, 1902).

AFRICA.

Further Discoveries at Zimbabwe.—Mr. R. N. Hall—well known as the joint author with Mr. Neal of the important work on the ancient ruins in Rhodesia reviewed in the *Journal* for April last—who has been commissioned by the Government of South Rhodesia to take steps for the preservation of the ruins at Zimbabwe, has already done some important work in the way of clearing the remains from rubbish and vegetation, so as not only to arrest their destruction, but to bring to light various hitherto undiscovered features. Some details respecting these are given in the *Scotsman* for September 27 last. The "acropolis" at Zimbabwe stands on a kopje 250 feet above the plain, and on the slopes of this walls enclosing passages winding up towards the summit have been laid bare, while other hitherto unknown passages have been found, as well as two large ancient entrances, a wall with dentelle pattern, a cement-lined enclosure, and three wedge-shaped buttresses, the last-named being of special interest as the first buttresses discovered in Rhodesia. The objects unearthed from the rubbish include the usual soapstone birds, beams and bowls, pottery and iron tools, and a gold bangle of wirework weighing 3½ ozs. Much has also been done for the preservation of the elliptical temple situated on the plain below the acropolis. The jungle with which it was entirely filled, and which was causing much damage to the ruins, has been cleared away, and an uninterrupted view of the structure, with its conical tower suggestive of the ancient phallic worship, can now be obtained. Other discoveries made here are four ancient drains, a double-curved entrance, three sets of stone steps, and several yards of cement flooring, which, however, as is the case with some of the upper parts of the walls, is a subsequent addition to the original structure. Among the objects found is a section of an ancient bowl believed to be the missing portion of the large bowl sent by Mr. Rhodes to the Cape Town Museum.

Captain Loefler's Surveys in the Shari Basin.—More than a year ago we announced the departure of an expedition under Captain Loefler for the exploration of the country traversed by the Logone, the important tributary of the Shari from the south-west. Captain Loefler has now returned after successfully accomplishing his object, and has given an account of his journey to a meeting of the Comité de l'Afrique Française, which is printed in the sixth number for the present year of the *Renseignements Coloniaux*, issued by that body. Both on the outward and return routes the traveller covered a large amount of new ground in the least-known part of the Shari basin. From Carnot on the upper Sanga, which was left in January, 1901, the route led north to Bam, occupying a commanding position near the meeting-point of the Sanga, Ubangi, and Shari basins, and thence north-east across the Wam, Captain Loefler's first object being to explore a direct route from the upper Sanga to the Shari. Beyond the Wam he passed through a broken country in which the granite rocks took various fantastic shapes, and afterwards descended to a plain watered by the Ba Ria and Ba Bo streams, which, after uniting, enter the Bahr Sara in about 9° N. The route led through the country of the Laka, a tribe which impressed the traveller by its splendid physique. Among them were seen the first horses met with on coming from the south. Between the Ba Bo and the Shari, which was struck at Kuno just south of 10° N., various depressions were traversed, which are evidently inundated during the rains, and then form a connection between the Bahr Sara and the Logone. At the time of Captain Loefler's passage the inhabitants depended solely on wells for their water-supply. As it proved impracticable to strike due west for the Logone, the party descended the Shari to Manjafa in about 11° N., and thence crossed over to the tributary, which was ascended for some 50 miles. The whole lower course of the Logone has recently been surveyed by Lieut. Kieffer, who found it navigable from its mouth to Lai, the crossing-place of Maistre in 1893. It was left at Safusu, somewhat to the north of 10°, the expedition then striking south-west towards the upper Benue, with a view to investigating the rumoured connection between the Shari and Benue, which has been a subject of discussion since Barth's time, no traveller having been able to follow the channel throughout its whole length. Captain Loefler traced it to Bifara, on the Mayo Kebbi, the furthest point on that river reached by Sir Claude Macdonald when attempting its ascent from the Benue. He has proved that a continuous depression exists between the Logone and the Benue, occupied in the dry season by a series of swamps and lakes, but affording a through water communication in the rains, when it is filled by the flood-water of the Logone. At that season there is, therefore, direct communication between the sea and Lake Chad. The return journey was made by a direct route along the Kamerun frontier and across the upper basin of the Logone, various branches of which were crossed between 8° and 6½° N. The principal branch, the Ba, was a fine stream, 90 yards wide and 6 feet deep, with a strong current. The Wam was re-crossed some 40 miles from its source, and south of it a rocky district was traversed, in which there are caverns capable of giving shelter to whole villages.

The German Expedition to Lake Chad.—The *Deutsches Kolonialblatt* for September 15 announces the return to the coast of Lieut.-Colonel Pavel, the leader of the German expedition which set out for Lake Chad early in the present year. The expedition left Garua, on the upper Berne, on March 26, and, after crossing the Ngollo and Lebeleba ranges in spite of armed resistance, reached Dikoa, Rabah's late capital, on April 21, and the lake on May 3. A French force was found at Dikoa, but it retired into French territory on the hoisting of the German flag, and a German garrison was left at the place when the main expedition started homewards. The return route led along the Logone to Karnak Logone, and thence *viâ* Marua to Garua, where again a garrison was left, so that German authority is considered to be at last established in the northern Hinterland of the Kamerun. Sultan Suberu of Yola was twice defeated among the spurs of the Mandara mountains, but managed to escape capture. A complaint is made that the proceedings of the British in Bornu are preventing caravans from entering German territory.

Aldabra as a Type of Limestone Reef Formation.—Prof. A. Voeltzkow, of Strassburg, who has for some time been publishing the results of his scientific journeys on the islands and mainland of East Africa in the *Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft*, has lately put forward his views as to the formation of Aldabra island (on which he spent a month), and of limestone reefs or banks in general (vol. xxvi. part 4 of the publication referred to—Frankfurt-a.-M., 1901). Aldabra presents at first sight the usual characters of an atoll, consisting as it does of a ring of land, divided into three islands by passages leading into a central lagoon. But a closer inspection shows that the land-ring is composed of a remarkably homogeneous white limestone, from which coral *débris* and coral sand are entirely absent. Specimens brought home by the writer have been carefully examined microscopically, and have, he thinks, thrown some light on the composition and structure of limestone reefs in general, to a consideration of which the first part of the paper is devoted. Prof. Voeltzkow discusses fully the organisms known as coccoliths and rhabdoliths, which in his opinion play a part in the formation of compact reef limestone similar to that played by foraminiferæ in the formation of chalk, etc. He considers them not as the dead fragments of more complex organisms, but rather as independent organisms to be regarded as the primordial or embryonal cells of the more developed structures; and instead of classing them, with Murray, among the algæ, is inclined to place them near the foraminiferæ. He likewise holds that the organisms are not pelagic, but live near the coasts and sea-bottoms, and that this is the reason why the deposits formed of their remains are not widely distributed, but of local occurrence. In the second part of the paper a detailed description is given (with map) of the structure and the general features of Aldabra, with notes on other limestone deposits of a similar nature occurring in Madagascar and elsewhere in the Indian ocean. The outer margin of the islands falls everywhere steeply to the sea, being often undercut, so that the casting up of coral *débris* by the waves would be an impossibility. In the lagoon there are mushroom-shaped islands, evidently the remnants of a once continuous bank, the formation of the lagoon being of comparatively recent date. The surface of the limestone has been hardened by atmospheric influences, and, apart from the dunes on the south coast, is almost devoid of the products of disintegration. Like other islands of the western Indian ocean, Aldabra rises from the sunken remains of an old continent, though in recent times a certain elevatory movement is traceable. Lying exposed to the full force of the trade wind drift, which here flows constantly westward, the elevatory movement must have been rapid enough to counteract the effects of abrasion until the bank had been raised, by the deposit of organic remains above alluded to, to a height at which reef-building corals could thrive. The effect of the current is to be seen in the form of the island—elongated in the direction of its flow—the growth of coral being limited to the exposed side, while sediment is deposited on the lee side. The general conclusion is that Aldabra is an old limestone reef, formed by the action of minute organisms, and deposited on a bank which has apparently not been affected by tectonic disturbances. Whether deposited on a level platform or on the summit of a submarine peak, the thickness of the limestone appears to be very considerable.

Navigation of the Zambezi.—The Foreign Office report (Annual No. 2861, 1902) on the trade of Chinde furnishes details of the present condition of the Zambezi traffic. The river from January to August is navigable for stern-wheel or other shallow-draught steamers from the sea to Tete, and thence to the foot of the Kebrabasa rapids, a distance of over 400 miles. Above the rapids it is again navigable for steamers to Zumbo, or even beyond, and a barge service is already established, while the African Lakes Corporation will place a steamer on this section before the end of this year. A narrow-gauge railway round the rapids will complete the chain, and the money for its construction is already subscribed. The route when complete will bring the East Coast in direct communication with the Cape by means of the Trans-continental railway, and will open up an enormous area for trade. No less than four companies run steamers on the lower Zambezi from the mouth to Tete, and it is stated that the service is likely to increase, as the development of the territories to the north proceeds apace. Tete is regarded as a convenient depôt for the transshipment of goods to countries lying far west of Lake Nyasa, which are not easily reached by the lake route.

Tripoli and the Hinterland Trade-routes.—Mr. Consul-General Jago communicates to the Foreign Office a summary of the trade and development of Tripoli during the last forty years (Misc. Ser. No. 578, 1902). In the early seventies a sudden and great development of the caravan trade with Central Africa took place, and the combined exports and imports, which in the decennium 1862–71 amounted to less than £2,000,000, exceeded £8,000,000 in 1872–81. The pioneers of this trade were the merchants of Ghadames, who periodically sent goods to their agents in Ghât, Kanem, Bornu, Kano, and Timbuktu, receiving ostrich feathers, ivory, and gold-dust in exchange. In 1873 the Tripoli merchants began to compete with them by sending caravans to the Central and Western Sudan, but in 1893 Rabah's invasion of Bornu, which was the chief interior market, involved the destruction of the Tripoli caravans, and has since closed the traffic entirely. The traders had then to fall back on Kano and Wadai, the trade with the latter passing principally *viâ* Benghazi, but tribal disturbances from 1895 up to last year again led to constant caravan pillaging, and last year's consignments of goods for Kano are only now beginning to start on receipt of better news as to the security of the roads. The caravan journey out and home occupies about eighteen months, and the profits are said to be 50 per cent. on the outlay, but the merchants foresee most clearly the future divergence of Central African trade to the waterways of the Benue and the Niger.

AMERICA.

Colonel Glazier's Expedition to Labrador.—Colonel Willard Glazier has, during the past summer, taken a party from the United States for the purpose of exploration on the east coast of Labrador. A short account of the trip appeared in the *Boston Evening Transcript* for September 10. The expedition included, in all, ten members, seven of whom were young men from Harvard, Boston, and other American universities, the remaining two (in addition to the leader) being Captain Perrigo and Lieut. Clark, the latter of whom had been with Peary in the north. It had been intended to start inland from Hamilton inlet, but as Eskimo were not to be had there, it was found necessary to go north to the Moravian Mission Station of Nain, in about 56½° N. The bay on which the station stands was followed upwards for some distance, when a fine river was discovered. It is said to be about 135 miles long, and to flow through a chain of seven lakes, the largest 40 miles long, and bounded by precipitous mountains, 1000 to 2000 feet above it, whence many cascades fall into it. The lakes are connected by rapids. After returning to Nain, the expedition went further north to Okak bay, the site of another mission station, whence the North river was ascended. The interior of the country was found to be totally devoid of human inhabitants, being bleak and desolate, with no vegetation but a few spruce and larch trees, and some alders and wild grasses. Caribou are in abundance, and are hunted by the Eskimo, while the bays and rivers abound in seals and fish. The commonest minerals are iron ore, copper, mica, and Labradorite. Collections were made of the birds, plants, the implements, etc., of the Eskimo, and of geological specimens. The party was cordially received by the missionaries, who are of German origin, and have done much to elevate the natives, while not interfering with their dress and mode of living. They have been established on the coast for about 150 years.

Exploration in Alaska.—The October number of the *National Geographic Magazine* reports the successful conclusion of the Geological Survey Expedition under Dr. A. H. Brooks, to which reference was made in the *Journal* a few months back. The route, which left the coast at Cook inlet, skirted the base of Mount McKinley, the highest known point of North America, and was continued to the Tanana. The full report on the journey, which led through the least-known part of Alaska, will be awaited with interest.

A Regional Study in Idaho.—In Nos. 53 and 54 of the "Water-Supply and Irrigation Papers," issued by the United States Department of the Interior (Washington, 1901), Prof. Israel C. Russell gives an admirable study in regional geography, in which not merely the physical features of the district, but the influence which these have in determining economic possibilities, are clearly brought out. The district dealt with is the Nez Perce county, in the south-west of Idaho, which was examined by the writer in 1900 with special reference to the possibilities of obtaining artesian water, the comparative smallness of the available water-supply being a serious matter in a country otherwise highly favoured by soil and climatic conditions, and even under existing circumstances producing a large amount of wheat. The main rivers, such as the Snake, Salmon, and others, flow in deep cañons, and, though copious, are in general unavailable for economic purposes, while, except on the higher plateaus, the rainfall is but meagre. Geologically, the region may be divided into an older and younger group of rocks, the former (probably pre-Tertiary) being of very varying character, while the latter consists principally of basalt (with interbedded layers of clay, sand, gravel, etc.), derived from the great Columbia river lava-flow, the products of disintegration of which constitute a soil of remarkable fertility. It is to the second group that the possibilities of obtaining an artesian water-supply are limited. The older rocks have been in part exposed by denudation (as *e.g.* at the base of the cañons), but in part rise as island-like areas ("steptoes") in a sea of lava, the surface having been deeply eroded before the latter was poured out. A large part of the plateaus formed by the younger group are essentially horizontal, although there is evidence of a general subsidence to the extent of perhaps 1000 feet. Elsewhere, however, the sheets have been tilted and the extent of differential movement may be tested by comparison with the horizonal Uniontown plateau, which may be taken as a datum plane. Of the present surface features, one series owes its origin to such tilting of the lava-sheets, which have produced sharp folds along certain lines, while in the Blue hills a dome-shaped uplift has been formed. A second class of leading features is due to erosion, portions of the original plateau being separated by deep cañons, which may either have been cut by "antecedent" or "consequent" streams. The courses of the former (which include the Snake, Salmon, and Clearwater) are to a great extent independent, either of the structure of the rocks or of the larger features of surface relief. Among the minor topographic features are stream-terraces, land-slides, solution-basins, and the undulations of the level plateaus, originally no doubt due to stream action, though now no water flows on the surface. In the second part of the paper, Prof. Russell discusses the possible improvement of the water-supply in the lava-covered area, either by means of horizontal wells or tunnels, for which the conditions seem specially promising in parts, or by the sinking of artesian wells. The fact that the lava was poured out in successive sheets, between which beds of clay, sand, gravel, volcanic dust, etc., occur, supplies conditions favourable to the existence of water under pressure, and a certain measure of success has already been obtained at the Dowd wells in the Lewiston-Clarkson Basin. Another basin where the required conditions may exist is that lying between Craig mountain and the foothills of the Bitterroot mountains. Some notes are also given on the economic geology of the region, it being pointed out that the older formations supply building-stone, gold, and ores of various metals, while lignite has been discovered in the sedimentary beds interstratified with the lava.

Recent Elevation of the Coast of the Gulf of Mexico.—Mr. T. W. Vaughan writes to *Science* (September 26, 1902) to the effect that, while doing field work along the shore of the Gulf of Mexico, south of Tallahassee, Florida, he last spring obtained information tending to prove that the coast in that vicinity has been perceptibly elevated within the memory of man. At St. Mark's, in Wakulla country, there is an old house built on piles, beneath which the water at high tide formerly passed into a pond in the field beyond. This is now no longer the case at spring tide, unless a strong south-east or south wind has been blowing for two or more days. A neap tide does not approach within 300 yards of the site of the pond. The elevation since the "fifties" is estimated at from 1 foot to 18 inches, or from 2 to 3 feet per century. This conclusion is in harmony with facts regarding the coast region of Texas lately brought to notice by Mr. R. T. Hill (cf. *Journal*, vol. xix. p. 402).

The Coal-beds of America.—A special report (Misc. Ser. No.580, 1902) on the coal industry of the consular district of Chicago has lately been issued by the Foreign Office, which shows roughly the amount of coal available for manufactures and railways in a great commercial area with undeveloped resources. Illinois stands at the head of the list with 42,000 square miles of coal-bearing formations, Missouri has 23,000, Kansas and Iowa 20,000, and Colorado nearly as much. The least is South Dakota, with 120 square miles; but Nebraska (Indian territory), Montana, and Wyoming have large areas, which are only in part touched. Illinois stands second to Pennsylvania in the coal-production of the United States. Coal in this state is being mined in 53 counties out of 102, and the 915 mines working last year turned out about 27,000,000 tons. In Wyoming the fields are in close proximity to known beds of copper and iron, so that it is merely a question of time when the combined mining industries will be at work. The seams are very thick and numerous, and about 4½ million tons were produced last year. In Dakota the deposits are chiefly lignite, and very little development has as yet taken place. Missouri produces about 4 million tons, Kansas about the same, and Iowa rather more. The thin seams of coal in the south-west of Nebraska are the ends of those of the western coal-fields in the three last-mentioned states, and but little mining is undertaken.

AUSTRALASIA.

Meteorology in Australasia.—The excellent work which has been done by the Queensland Weather Bureau, since its organization under Mr. Clement L. Wragge in 1887, has been widely recognized, and much disappointment was naturally felt on the announcement, made in May last, that the Queensland Government felt itself compelled, by the necessity for retrenchment, to close the Bureau from June 30. Negotiations had been set on foot to secure the taking over of the work by the Federal Government, it being felt that the work was national in character, and as such could fairly claim to be performed under the auspices of the central authority. It was, however, found impossible to carry through the legislation necessary for the establishment of a Federal Meteorological Department during the current session of parliament, and considerable anxiety was felt lest the continuity of the valuable series of meteorological records from all parts of the country should be broken during the interregnum which seemed unavoidable, to say nothing of the risk incurred of loss or damage to the expensive self-recording instruments placed at the stations all over Queensland. This danger has, we are glad to say, not been realized, the Governments of Queensland, New South Wales, and Tasmania having provided funds, to the total extent of £1000 per annum, to enable Mr. Wragge to continue his useful work for the time being, at least, while the Federal Government has promised aid in the form of free transmission of meteorological data by the State telegraphs. The new office controlled by Mr. Wragge has been named the "Central Weather Bureau," and in connection with it he has commenced the publication of a journal (bearing the title *Wragge*) devoted to the interests of Australasian meteorology, and to serve as a medium for the issue of the weekly forecasts, which have in the past been a special feature of the Weather Bureau. The first number was issued on July 17.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Fauna of Mountain Lakes.—Prof. F. Zschokke (Basel), in his prize essay on the fauna of high mountain lakes, has compared it with that of lakes in the Riesengebirge and other mountains of moderate altitude, with results of considerable general importance. For this comparison he makes special use of the researches of Prof. O. Zacharias in the 'Koppenteichen' (see *Geographical Journal*, September, 1897, p. 323). Zschokke found that in a mountain system of relatively small elevation the alpine conditions and forms of life occur at a lower absolute level than in high mountains. The Grosse Teich, in the Riesengebirge, 4000 feet above sea-level, is inhabited by forty species; the Kleine Teich, 3830 feet, by fifty-two species. Of these species, Zschokke found from twenty to forty-eight per cent. in the lakes of the Rhætic Alps, near the Swiss-Austrian frontier, south-east of the Boden See, at altitudes of 6000 and 7200 feet. Further, he found that the fauna of alpine lakes at the same altitudes as those in the lower mountain systems differs little from that of lakes of the plains. The greater the mean and maximum elevation of the mountains, the higher the lakes of corresponding fauna. This fact accords well with the observations of E. Richter on the snow-line, which in the central Alps occurs 2000 feet higher than in the northern and southern limestone Alps (see *Geographical Journal*, September, 1899, p. 316); and also with researches, notably those of Brückner, on the variations in the limiting levels of other elements. The relations now ascertained place the whole subject of *orometric values*, which has hitherto received but little attention in England, in a clear light. Corresponding to the similarity of fauna in the lakes, there is a similarity of conditions of light and temperature. The mean summer temperature of the water in the two groups does not exceed 50° to 54° Fahr. The topographic features in the immediate neighbourhood of the lakes must be taken into account. Faunistically similar lakes may lie in deeply shaded spots, but, on the other hand, those alpine lakes which are at the same elevations as the lakes of lower mountains may enjoy the same conditions as regards sunlight as low-lying lakes altogether outside the alpine region.

The Cruise of the "Princess Alice."—A letter from Mr. J. Y. Buchanan, containing an account of the work of the Prince of Monaco's yacht *Princess Alice* during this summer, was published in the *Times* of September 25. The yacht left Gibraltar on July 23, and steered westward towards the Azores. On the following day, being in a position where a remarkable haul of large crustaceans was made on the homeward journey last year, the trawl was put over in 800 fathoms. The trawl "failed to bring up the rich harvest of animals expected," although "it worked quite well, and brought up what it found, which was mainly mud." The bottom temperature was found to be 9° C., compared to a normal of 4°·5 C. at 800 fathoms in the North Atlantic, indicating that the position (lat. 36° 6′ N., long. 7° 56′ W.) was one of the main drains of overflow from the abysmal regions of the Mediterranean. A rough estimate shows that the bottom water was of Mediterranean and Atlantic origin in a mixture of about equal parts. The Gorringe or Getysburg bank, examined by the former *Princess Alice* on July 25, 1894, was re-examined on July 25, 1902. No new results of special importance were obtained, but Mr. Buchanan notes as remarkable that "the presence of the bank was shown quite unmistakably by the swirls and ripples on the surface of the sea to an extent that I have never witnessed on any other oceanic shoal having the same depth of water over it." July 27 was spent in sounding over the Josephine bank, depths of about 120 fathoms being uniformly obtained, and Punta Delgada was reached on July 31. On leaving Punta Delgada, the yacht proceeded to the channel which separates the islands of Terceira and St. Michael's, where a sounding of 1900 fathoms was obtained by the *Hirondelle* some years ago. A depth of 1645 fathoms was obtained near the old spot, confirming the existence of deep water in this locality. The bottom temperature was 5° C., two degrees above the normal for the depth, indicating that this depth occurs in an enclosed basin. The existence of this basin was confirmed by other soundings, and it was appropriately named the "Hirondelle deep." The rim of the basin is 850 to 900 fathoms from the surface. A few days were next spent on the Princess Alice bank, south-west of Fayal, and it is remarkable that, whereas this has hitherto proved a very productive fishing-ground, this year "hardly anything of any kind was caught by any means." On quitting the islands, the yacht made for a spot where two soundings of 70 and 48 fathoms, attributed to the ship *Chaucer*, 1850, are marked. The soundings were not confirmed, but some evidence was obtained that a bank may exist in the vicinity, although time did not allow of full investigation. During the search, on September 6, the trawl dragged into shallow water at a point where a depth of 1300 fathoms was expected, and brought up a remarkable haul of manganese-covered coral. The yacht returned to Havre on September 17.

giving an outline of its history accompanies this interesting relic, signed by the Portuguese Commandante Militar Superior at Tete, Mr. Carlos Wiese, and Vice-Consul H. R. Wallis.

Geography at London and Birmingham Universities.—The regulations lately issued with regard to geography, both at London and Birmingham universities, show that satisfactory progress is being at last made towards a just appreciation of the possibilities offered by the subject as a branch of scientific study. Especially gratifying is the fact that the old arbitrary division between physical and political geography seems at last to be disappearing, with a corresponding gain to the unity of the subject and its special value as the meeting-ground of the sciences of Nature and Man. The revised regulations for the matriculation examination at London university put down "Physical and General Geography" as one of the twenty-two subjects from which two out of the total of five subjects offered may be selected. It is, therefore, not obligatory, but is placed on the same footing with history (ancient or modern), logic, biology, etc. The importance of regional treatment is fully recognized in the syllabus, and especial attention is directed to such aspects of the regions studied as the contrasts and features of land-relief, climatic contrasts and their effect on agriculture, the position and characteristics of regions of dense or sparse population, and so forth; while a knowledge must be shown of the main physical causes of the phenomena described. The Birmingham University Calendar for 1902–1903 (Macmillan) contains a full statement of the various subjects included under the faculties of science, art, commerce, and medicine, and it is satisfactory to find that geography has been conceded a place under the first head. Physical and political geography are here too united as a single subject, the two branches being taken concurrently during two years. Thus, besides a study of the present surface features and the agents of change to which they are due, attention is directed to Man and his works, as related to the phenomena of the Earth on which he dwells. The regional aspect of the subject is throughout kept well in view.* It is, however, somewhat disappointing to find that the subject ranks only (like physiography) as a branch of Geology, and no clue is given to the weight attached to it in the final examination. The division between physiography and physical geography is likewise a little unfortunate, the former being treated as a distinct subject, although it deals not only with the principles underlying all geographical science, but such special branches of the subject as the origin and development of landscape features, drainage systems, etc.; in fact, the whole of the science of geomorphology as well as of the distribution of life upon the surface. A certain amount of overlapping of the subjects, therefore, seems inevitable. Again, from its place in the faculty of science, geography cannot be taken up as a subject in itself by students under the faculty of commerce, although its vital importance in relation to many of the subjects included in the latter cannot be gainsaid. Such difficulties must arise until the importance of geography as a meeting-ground of many different studies is still further recognized by its adoption as one of the fundamental bases of university education.

Long Vacation Course at Cambridge.—The reader in geography at Cambridge, Mr. H. Yule Oldham, during August delivered a course of twelve lectures on "Geography in its Physical Aspects," which were attended by 172 students, nearly all teachers in schools, for whom the lectures were principally intended. Among them were students from France, Germany, Holland, Norway, South

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* The syllabus is hardly up-to-date in its recommendations as to text-books of Political Geography, no mention being made, *e.g.*, of Mill's 'International Geography.'

Africa, and the United States. A good deal of practical work was also done in the open, and a special excursion made to the Fen country, when some important experiments on the curvature of the Earth's surface were performed.

The Wheat Crop of 1902.—*Export* (xxiv. No. 40) quotes from the *Bulletin des Halles, Bourses et Marchés* statistics of the wheat crop of the world for 1902, by countries, with a comparison of the same crop in 1900 and 1901. The total production of European and extra-European countries together is given at 1,037,185,000 hectolitres (356,662,000 quarters), of which Europe produced about 56·4 per cent. Although considerably larger than the total of the three preceding years, this amount fell short of that recorded for 1898, which was the largest yet attained. Most of the European countries show an increase as compared with either of the two preceding years, the two largest producers—Russia and France—showing increases on 1901 of 9·3 and 10·5 per cent. respectively. The total yield of extra-European countries is put below the figure for 1901, the deficit being due almost entirely to a decreased yield in the United States and India, which show a fall of 12·7 and 11 per cent. respectively. Thus whereas the yield of the United States in 1901 exceeded that of Russia and France combined, in 1902 the position was reversed. Canada (the yield from which is shown as identical in 1901 and 1902, that for the latter being possibly estimated only) comes ninth on the list, being surpassed by six European countries (Russia, France, Austria-Hungary, Germany, Italy, Spain), as well as by the United States and India.

OBITUARY.

Canon Rawlinson.

Among geographers the name of Rawlinson will always recall the memory of that distinguished authority on all questions relating to Central Asia, whether geographical, historical, or political, who received the Founder's Medal of our Society more than sixty years ago, and who was twice President of the Royal Geographical Society. Sir Henry Rawlinson's younger brother, George, whose death occurred early last week, was the classical scholar and historian rather than the geographer. Indeed, though within a few weeks of his ninetieth birthday at the time of his death, his election as a Fellow of the Society dates no further back than 1890. Canon Rawlinson possessed, however, an extensive and intimate knowledge of the lands and old-world peoples of the nearer East. Born November 23, 1812, he obtained a First Class in the Final School of Classics at Oxford in 1838, and two years later was elected to a Fellowship at Exeter College. After a brief absence from Oxford subsequent to his marriage in 1846, he resumed work at the University, and, pursuing his own studies in addition to his other labours, brought out in 1858 his well-known translation of Herodotus, enriched with many valuable notes, not only from his own pen, but by Sir Henry Rawlinson and Sir Gardner Wilkinson. In 1861 he was appointed to the Camden Chair of Ancient History, which he occupied until 1889. The first fifteen years of his professorship saw the production of Canon Rawlinson's great work on the early monarchies of the Eastern World. His theory of a Chaldean monarchy provoked some criticism, but in subsequent editions of the work it has not been found necessary materially to modify the view originally expressed. Among other books that have issued from Canon Rawlinson's pen, we may mention a 'Manual of Ancient History,' which appeared in 1869; a 'History of Egypt' (1881); a 'History of Phœnicia' (1889), written for the Story of the Nations Series; and a 'History of Parthia' (1893).

Mr. R. A. Sterndale.

We regret to announce the death, which occurred on October 3, of Mr. Robert Armitage Sterndale, C.M.G., Governor of St. Helena, and a Fellow of the Society for the past quarter of a century. Mr. Sterndale was born in Derbyshire in 1839, and at the age of seventeen left this country to take up an appointment under the Indian Government, in whose service he remained until 1890. During the Indian Mutiny he served in the army as a volunteer officer, but on the conclusion of military operations returned to civilian employment. In the Financial Department he gradually worked his way up from one post to another until he became Accountant-General, first for Bombay, and afterwards for Madras. He took a great interest in geographical and other scientific studies, and published an account of the district of Seoni, and works on, amongst other subjects, the mammalia of British India and Ceylon, denizens of the jungle, and Turkey and India. After his retirement from the service of the Indian Government, Mr. Sterndale conducted the administration of St. Helena in 1895–96, and a year later was appointed governor of the island.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Is. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Austria. *Petermanns M.* 48 (1902): 121–132. **Graber.**
Geomorphologische Studien aus dem oberösterreichischen Mühlviertel. Von Dr. Hermann Veit Graber. *With Map.*

Balkan Peninsula. **Beck von Mannagetta.**

Die Vegetation der Erde. . . . herausgegeben von A. Engler und O. Drude. IV. Die Vegetations-Verhältnisse der illyrischen Länder begreifend Südkroatien, die Quarnero-Inseln. Dalmatien, Bosnien und die Hercegovina, Montenegro, Nordalbanien, den Sandžak Novipazar und Serbien. Von Dr. Günther Ritter Beck von Mannagetta. Leipzig: W. Engelmann, 1901. Size 10½ × 7, pp. xvi. and 534. *Maps and Illustrations.*

This will be the subject of a notice.

Bulgaria—Rainfall. *Petermanns M.* 48 (1902): 145–151. **Kassner.**

Die Niederschlagsverteilung in Bulgarien. Von Dr. C. Kassner. *With Map.*

France. **Baedeker.**

Southern France, including Corsica. Handbook for Travellers by Karl Baedeker. Leipsic: Karl Baedeker; London: Dulau & Co., 1902. Size 6½ × 4½, pp. xxviii. and 548. *Maps, Plans, and Panorama. Price 9m.* 2 *copies, one presented by the Editor, the other by Messrs. Dulau & Co.*

France—Brittany. **Baring-Gould.**

Brittany by S. Baring-Gould. London: Methuen & Co., 1902. Size 6 × 4, pp. ix. and 248. *Maps and Illustrations. Price 3s. Presented by the Publishers.*

This little guide will be found of much use to the visitor to Brittany, giving as it does a bird's eye view of all that most deserves attention on the part of the tourist. The first part deals in turn with the general features, geology, botany, history, antiquities, etc., of the country, and is followed, as is the case in other guides of the series, with a description of the places arranged alphabetically. The illustrations are exceedingly tasteful.

France—Seine-et-Marne. *Ann. G.* 11 (1902): 295–314. **Barré.**

Le Relief de la forêt de Fontainebleau. Par O. Barré. *With Map and Sections.*

France—Statistics. ——

République Française. Ministère du Commerce, de l'Industrie, des Postes et des Télégraphes. Direction du Travail. Statistique Générale de la France. Annuaire Statistique. Vingt-et-unième volume. 1901. Paris, 1902. Size 11 × 7½, pp. xlii. and 592.

France—Towns. *G. Teacher* 1 (1902): 97–108. **Dickinson.**

The Position of Towns. Illustrated by an analysis of the Natural Regions and Centres of France. By B. B. Dickinson. *With Maps.*

Germany—Botanical Geography. **Graebner.**

Die Vegetation der Erde. . . . herausgegeben von A. Engler und O. Drude. V. Die Heide Norddeutschlands und die sich anschliessenden Formationen in biologischer Betrachtung. Eine Schilderung ihrer Vegetationsverhältnisse, ihrer Existenzbedingungen und ihrer Beziehungen zu den übrigen Pflanzenformationen, besonders zu Wald und Moor, bearbeitet von P. Graebner. Leipzig: W. Englemann, 1901. Size 10½ × 7, pp. xii. and 320. *Maps and Illustrations.*

This will be specially noticed.

Germany—Earthquake Stations. *Petermanns M.* 48 (1902): 151–160. **Gerland.**

Ueber Verteilung, Einrichtung und Verbindung der Erdbebenstationen in Deutschen Reich. Von Prof. Dr. G. Gerland. *With Map.*

Germany—Hanover. **Nedderich.**

Wirtschaftsgeographische Verhältnisse, Ansiedlungen und Bevölkerungsverteilung im Ostfälischen Hügel- und Tieflande. Von Dr. Wilhelm Nedderich. (Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Vierzehnter Band, Heft 3.) Stuttgart: J. Engelhorn, 1902. Size 9½ × 6½, pp. 151–330. *Maps. Price 9m.*

The district dealt with lies around Hildesheim.

Germany—Mammalia. *Z. Ges. Erdk. Berlin* (1902): 473–497. **Matschie.**

Die Säugetierwelt Deutschlands, einst und jetzt, in ihren Beziehungen zur Tierverbreitung. Von Paul Matschie.

Germany—Plant-distribution. **Schulz.**

Studien über die phanerogame Flora und Pflanzendecke des Saalebezirkes. Von Dr. August Schulz. 1. Die Wanderungen der Phanerogamen im Saalebezirke seit dem Ausgange der letzten kalten Periode. Halle-a.-S., Tausch & Grosse, 1902. Size 9½ × 6½, pp. 58. *Map.*

Hungary—Gravity-determinations. **Sterneck.**
M.K. u. K. Militär.-G. I. **21** (1901): 77–98.

Relative Schwerebestimmungen in der Umgebung des Plattensees, ausgeführt im Jahr 1901. Von Dr. Robert v. Sterneck.

Italy. *B.S.G. Italiana* **3** (1902): 675-682. **Bertolini.**

Per la storia della conoscenza scientifica del nostro paese. Il fenomeno dei colori complementari al Monte San Genesio. Nota del prof. Gian Lodovico Bertolini.

The author quotes the description given early in the nineteenth century by Guiseppe Cortesi, of the phenomenon observed on Monte San Genesio, which consists in the assumption of a greenish colour by objects seen in association with the bright red soil of the mountain.

Italy—Arno. *Riv. G. Italiana* **9** (1902): 368-374. 425-436. **Oberti.**

Il bacino dell' Arno. Saggio di geografia fisica e antropica del Prof. Eugenio Oberti.

Italy—Earth-movements. *B.S.G. Italiana* **3** (1902): 579-597. **Stefano.**

Probabile sollevamento attuale della costa Jonica calabrese? Osservazioni di fisiodinamica e brevi cenni sul bradisisma della Calabria occidentale. Nota del dott. Giuseppe de Stefano.

Italy—Rome. *Atti R.A. Lincei, Rendiconti* **11** (1902): 431-433. **Reina.**

Determinazioni astronomiche di latitudine e di azimut eseguite a Roma (S. Pietro in Vincoli), a M. Cimino ed. a M. Peglia negli anni 1900 e 1901. Nota del prof. V. Reina.

Italy—Sardinia. *Sitzb. K.P.A.W. Berlin* (1902): 808-829. **Tornquist.**

Ergebnisse einer Bereisung der Insel Sardinien. Von Prof. Dr. A. Tornquist.

This is the subject of a note (p. 534, *ante*).

Italy—Sicily. **Churchill.**

Trade of Sicily for the year 1901. Foreign Office, Annual No. 2887, 1902. Size 9½ × 6, pp. 58. *Price 3d.*

During 1901, a new British line started a regular service from London to Palermo.

Northern Europe—Lakes. **Pettersson.**

Resultaten af den internationella Undersökningen af norra Europas djupa sjöar och innanhaf år 1900. Sammanstälda af O. Pettersson. (Bihang till K. Svenska Vet-Akad. Handlingar. Band 28. Afd. II. No. 2.) Stockholm: P. A. Norstedt & Söner, 1902. Size 8½ × 6½, pp. 18.

Records determinations of serial temperatures for various lakes of Sweden, Finland, etc., at different times of year.

Norway—Auroras. **Tromholt.**

Catalog der in Norwegen bis juni 1878 beobachteten Nordlichter, zusammengestellt von Sophus Tromholt. Herausgegeben von J. Fr. Schroeter. Kristiania, 1902. Size 12½ × 9½, pp. xxiv. and 422.

Russia. **Baedeker.**

La Russie. Manuel du Voyageur par K. Baedeker. Troisième Édition refondue et mise à jour. Leipzig: Karl Baedeker, 1902. Size 6½ × 4½, pp. l. and 476. *Maps and Plans. Price* 15*m. Presented by the Author.*

This corresponds to the fifth German edition, issued in 1901, and, like it, has been much extended as compared with the previous edition, especially as regards the Caucasus and the Russian Asiatic railways.

Russia—Poland and Lithuania. **Murray.**

Trade and Agriculture of Poland and Lithuania for the year 1901. Foreign Office, Annual No. 2810, 1902. Size 9½ × 6, pp. 42. *Price 2½d.*

Russia—Ural. **Duparc and Pearce.**
Mém. S. Phys. et d'Hist. Nat. Genève **34** (1902): 57–218.

Recherches géologiques et pétrographiques sur l'Oural du Nord dans la Rastesskaya et Kizelowskaya-Datcha (Gouvernement de Perm). Par Louis Duparc et Francis Pearce. *With Map and Plates.*

This will be noticed in the Monthly Record.

Spain—Mining Industry. ———

Mining Industry in Spain during the year 1901. Foreign Office, Miscellaneous, No. 579, 1902. Size 10 × 6. pp. 28. *Price 2d*

Sweden—Gothland. ———

The Ancient City of Wisby, once the Queen of the Baltic. Island of Gothland, Sweden. Stockholm, 1902. Size 8 × 4½, pp. 28. *Map (on cover) and Illustrations.*

Switzerland—Census. ———

La Population des Communes de la Suisse. Par le Bureau de statistique du Département fédéral de l'Intérieur. Bern: Stämpfli & Cie., 1901. Size 11½ × 9, pp. 32.

Switzerland—Simplon Tunnel. ———

Rapport sur les venues d'eau rencontrées dans le tunnel du Simplon du côté d'Iselle. Lausanne: Imp. Corbaz and Cie., 1902. Size 11 × 8½, pp. 28. *Profile. Presented by Mr. Heinrich Brunner.*

Turkey—Monastir. **Castelmola.**

Turchia. Il Vilaiet di Monastir. Rapporto del Cav. O. Gastani d'Aragona di Castelmola. Bollettino del Ministero degli Affari Esteri. Maggio 1902. Roma, 1902. Size 9 × 6, pp. 16.

United Kingdom—Bognor. **Morris and Thompson.**

Bognor Climatological Society. Annual Report and Results of the Observations made during the year 1901, at the Bognor Climatological Station. By H. C. L. Morris and A. G. Thompson. Size 9½ × 7, pp. 6. *Tables.*

United Kingdom—Dartmoor. *Geolog. Mag.* **9** (1902): 397–401. **Lowe.**

A Fragment of Physical Geography: The Past and Present of a bit of Dartmoor. By Harford J. Lowe. *With Sketch-maps.*

United Kingdom—England. *Quarterly J. Geolog. S.* (1902): 572-608. **Dwerryhouse.**

The Glaciation of Teesdale, Weardale, and the Tyne Valley, and their Tributary Valleys. By A. R. Dwerryhouse. *With Maps and Sections.*

United Kingdom—England—Devon. **Ussher.**

Memoirs of the Geological Survey, England and Wales. The Geology of the Country around Exeter. (Explanation of Sheet 325.) By W. A. E. Ussher. With Notes on the Petrology of the Igneous Rocks. By J. J. H. Teall. London: E. Stanford, 1902. Size 9½ × 6, pp. vi. and 122. *Sections. Price* 2*s.*

United Kingdom—England—Devon. **Ward and Baddeley.**

Thorough Guide Series. South Devon (including West Dorset Coast from Weymouth) and South Cornwall, with a full description of Dartmoor and the Scilly Isles. By C. S. Ward and M. J. B. Baddeley. 6th Edition, Revised. London: Dulau & Co., 1902. Size 6½ × 4½, pp. 8, xx., and 230. *Maps and Plans. Price* 4*s. net. Presented by the Publishers.*

The section-maps are contoured in this edition.

United Kingdom—England—Essex. *Nineteenth Century* **52** (1902): 239-250. **Hunter.**

The Reconstruction of Hainault Forest. By Sir Robert Hunter. *With Map.*

United Kingdom—England—Hampshire. **Reid.**

Memoirs of the Geological Survey. England and Wales. The Geology of the Country around Ringwood. (Explanation of Sheet 314.) By Clement Reid, F.R.S. With Contributions by F. J. Bennett and Ernest E. L. Dixon. London: E. Stanford, 1902. Size 9½ × 6, pp. 62. *Sketch-map. Price* 1*s.*

United Kingdom—England—Hampshire. **Reid.**

Memoirs of the Geological Survey. England and Wales. The Geology of the Country around Southampton. (Explanation of Sheet 315.) By Clement Reid, F.R.S. With Contributions by W. Whitaker. London: E. Stanford, 1902. Size 9½ × 6, pp. iv. and 70. *Illustrations. Price* 1*s.* 6*d.*

United Kingdom—England—Norfolk. **Dutt.**

Norfolk. By William A. Dutt. London: Methuen & Co., 1902. Size 6 × 4, pp. vii. and 277. *Maps and Illustrations. Price* 3*s. Presented by the Publishers.*

Like others of this dainty series of 'Little Guides,' this consists of general chapters on Norfolk from various points of view, occupying some forty pages, followed by detailed descriptions of all the more important places, which make up the bulk of the volume. It thus forms a handy compendium of all that is of most interest in the county.

United Kingdom—Gales. *Q.J.R. S. Meteorolog.* **28** (1902): 121-158. **Brodie.**

The Prevalence of Gales on the Coasts of the British Islands during the Thirty years 1871-1900. By Frederick J. Brodie. *With Diagrams.*

United Kingdom—Ireland. **Baddeley.**

Thorough Guide Series. Ireland (Part i.): Northern Counties, including Dublin and Neighbourhood. By M. J. B. Baddeley. Fifth Edition, Revised. London: Dulau & Co., 1902. Size 6½ × 4½, pp. xvi., 12, and 212. *Maps and Plans. Price 4s. net. Presented by the Publisher.*

All the section maps are contoured in this edition, and additions and corrections have been made in the text in points of detail.

United Kingdom—Ireland. **Hoskyn.**

The Irish Coast Pilot. Originally compiled from various Admiralty Surveys. By Staff Commander Richard Hoskyn. Fifth Edition. London, 1902. Size 9½ × 6, pp. xx. and 564. *Chart. Price 3s. 6d. Presented by the Hydrographer, Admiralty.*

United Kingdom—Lake District. **Baddeley.**

Thorough Guide Series. The English Lake District. By M. J. B. Baddeley. Ninth Edition, thoroughly Revised. London: Dulau & Co., 1902. Size 6½ × 4½, pp. xxx., 248, and 20. *Maps, Plan, and Panoramas. Price 5s. net. Presented by the Publishers.*

The rapidity with which new editions of this guide have been called for, is an evidence of its excellence, as well as of the popularity of the district with which it deals. A small addition which might prove useful in the next edition would be the extension of map No. 9 in the south-east corner, so as to bring both upper branches of Great Langdale into one sheet. The tracks over the Garburn pass, and over Matterdale common at the northern end of the Helvellyn range, might also be shown as possible for cyclists, as their use occasionally saves a long *détour*, and neither is so rough as that over the Wrynose pass.

United Kingdom—London. *Nineteenth Century* **52** (1902): 94-111. **Egerton.**

The Port of London. By the Right Hon. Earl Egerton of Tatton. *With Map.*

United Kingdom—Scotland. *J.G.* 1 (1902): 160-167. **Luther.**

The Weavers of the Western Isles. By Agnes Vinton Luther. *With Illustrations.*

United Kingdom—Scotland—Edinburgh. **Richardson.**
Scottish G. Mag. **18** (1902): 337-357.

The Physiography of Edinburgh. A View from Arthur's Seat. By Ralph Richardson. *With Map. Also separate copy, presented by the Author.*

ASIA.

Asia. *Deutsche Rundschau G.* **24** (1902): 499-510. **Jüttner.**

Fortschritte der geographischen Forschungen und Reisen im Jahre 1901. 2. Asien. Von Dr. J. M. Jüttner.

Central Asia. *G.Z.* **8** (1902): 249-266, 323-339. **Futterer.**

Der Pe-schan als Typus der Felsenwüste. Ein Beitrag zur Charakteristik der Felsenwüsten Zentralasiens. Nach eigenen Erfahrungen und Forschungen zusammengestellt von Prof. Dr. K. Futterer. *With Plates.*

Central Asia. *Petermanns M.* **48** (1902): 160-162. **Hedin.**

Uebersicht meiner Reisen in Zentralasien 1899-1902. Von Dr. Sven v. Hedin. *With Map.*

China. *Tour du Monde* **8** (1902): 313-372. **Leprince-Ringuet.**

Voyage dans les Provinces du Nord de la Chine (1898-1899). Par F. Leprince-Ringuet. *With Map and Illustrations.*

China—Trade. ———

China. Imperial Maritime Customs. I. Statistical Series: Nos. 3 and 4. Returns of Trade and Trade Reports for the year 1901. Part i. Report on the Trade of China, and abstract of Statistics. Shanghai, 1902. Size 11 × 8½, pp. 34.

Chinese Empire—Tibet. **Chandra Das.**

Journey to Lhasa and Central Tibet. By Sarat Chandra Das. Edited by the Hon. W. W. Rockhill. London: John Murray, 1902. Size 8½ × 5½, pp. xiv. and 286. *Price 12s. net. Maps, Plans, and Illustrations.*

This is the latest issue of the extra publications of the Royal Geographical Society. It will be noticed elsewhere.

Chinese Empire—Tibet. **Magnaghi.**
Rev. G. Italiana **8** (1901): 545, 609; **9** (1902): 39, 105, 170, 241, 299.

Relazione inedita di un viaggio al Tibet, del Padre Cassiano Beligatti da Macerata (prima metà del secolo xviii.). Per Alberto Magnaghi.

Eastern Asia. *Sitzb. K.P.A.W. Berlin* (1902): 944–975. **Richthofen.**

Geomorphologische Studien aus Ostasien, III. Die morphologische Stellung von Formosa und den Riukiu-Inseln. Von Ferdinand von Richthofen. *With Map.*

This will be noticed elsewhere.

French India. **Castonnet des Fosses.**

L'Inde Française au XVIII^e siècle. Ouvrage posthume de Henri Castonnet des Fosses. Paris: Société de Géographie Commerciale [not dated]. Size 7½ × 5, pp. vi. and 458. *Portrait. Price* 3.50 *fr.*

A clear and instructive account of the early French commercial intercourse with India, and the struggle with Great Britain down to the death of Dupleix.

India—Census. ———

Census of India, 1901. Vol. iv. Assam. Part i. Report. By B. C. Allen (Shillong, 1902, pp. xvi. and 180). Vol. iv*a*. Assam. Part ii. Tables. By B. C. Allen (Shillong, 1902, pp. 306). Vol. viii. Berar. Part i. Report. By Ardaseer Dinshawji Chinoy (Allahabad, 1902, pp. xii. and 278). Vol. viii*a*. Berar. Part ii. Imperial Tables. By A. D. Chinoy (Allahabad, 1902, pp. 208). Vol. viii*b*. Berar. Part iii. Provincial Tables. By A. D. Chinoy (Allahabad, 1902, pp. 124). Vol. ix. Bombay. Part i. Report. By R. E. Enthoven (Bombay, 1902, pp. viii. and 260). Vol. ix*a*. Bombay. Part ii. Imperial Tables. By R. E. Enthoven (Bombay, 1902, pp. ii., 560, and cxii.). Vol. ix*b*. Bombay. Part iii. Provincial Tables. By R. E. Enthoven (Bombay, 1902, pp. 282). Vol. x. Bombay (Town and Island). Part iv. History. By S. M. Edwardes (Bombay, 1901, pp. ii. and 156). Vol. xi. Ditto. Part v. Report. By S. M. Edwardes (Bombay, 1901, pp. 116). Vol. xi*a*. Ditto. Part vi. Tables. By S. M. Edwardes (Bombay, 1901, pp. 330). Vol. xiii. Central Provinces. Part i. Report. By R. V. Russell (Nagpur, 1902, pp. xii. and 314). Vol. xiii*a*. Central Provinces. Part ii. Imperial Tables. By R. V. Russell (Allahabad, 1902, pp. 600). Size 13½ × 8½. *Maps, Plans, etc.*

India and Ceylon. **Brown.**

From Calcutta to Bombay Coasting, being the second edition of the Handbook to the Ports on the Coast of India between Calcutta and Bombay, including Ceylon, and the Maldive and Laccadive Islands. By Lieut. H. S. Brown. London: J. D. Potter. 1902. Size 9½ × 6, pp. 358. *Charts and Illustrations. Price* 10*s. Presented by the Publisher.*

India—Nicobar Islands. *J. Anthrop. I.* **32** (1902): 202–238. **Solomon.**

Extracts from Diaries kept in Car Nicobar. By V. Solomon. 1895–1901. *With Plate.*

The author, whose diaries deal chiefly with native customs and ceremonies, is a native government agent, formerly a catechist, who has done much in the interests of civilization in the group.

India and Persia. **Ronaldshay.**

Sport and Politics under an Eastern Sky. By the Earl of Ronaldshay. Edinburgh and London: W. Blackwood & Sons. 1902. Size 9½ × 6½, pp. xxiv. and 414. *Maps and Illustrations. Price* 21*s. net. Presented by the Publishers.*

This will be reviewed elsewhere.

India—Rajputana. *P.I. Civil Engineers* **148** (1902): 263–275. **Hearn.**

Railway Surveying on the Pipli Ghat. By Captain G. R. Hearn. *Plans.*

Describes a survey for a line from Bara to Marwar, across the Aravalli range, designed to supply a link on a new route between Calcutta and Karachi.

India—Trigonometrical Survey. **Eccles.**

Account of the Operations of the Great Trigonometrical Survey of India. Vol. iv. Details of the Tidal Observations taken during the period from 1873 to 1892, and a description of the Methods of Reduction. By J. Eccles. Prepared under the Directions of Major S. G. Burrard. Published under the orders of Col. St. G. C. Gore. Dehra Dun, 1901. Size 12½ × 10, pp. xvi., 384, and 152. *Charts, Diagrams, and Plates. Price* 10 *rupees* 8 *annas. Presented by the Survey of India.*

Korea. **Goffe.**
Trade of Corea for the year 1901. Foreign Office, Annual No. 2849, July, 1902. Size 9½ × 6, pp. 26. *Diagram.*

Includes some details on the railways, existing and projected, of Korea.

Malay Archipelago—Java. **Davids.**
Trade of Java for the year 1901. Foreign Office, Annual No. 2863, July, 1902. Size 9½ × 6, pp. 22.

Malay Peninsula. *J. Anthrop. I.* 32 (1902): 124–141. **Skeat.**
The Wild Tribes of the Malay Peninsula. By W. W. Skeat. *With Illustrations.*

Malay States. **Treacher.**
Report by the Resident-General of the Federated Malay States to H.E. the High Commissioner. Kuala Lumpur, 1902. Size 13½ × 8½, pp. 26. *Diagrams.*

Persia. **Durand.**
An Autumn Tour in Western Persia. By E. R. Durand. London: A. Constable & Co., 1902. Size 9 × 5½, pp. 266. *Map and Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

A brightly written account of a circular journey through the mountainous districts of south-west Persia, carried out by Sir Mortimer and Lady Durand in 1899. The principal objects were to see the old capital of Ispahan; to make the acquaintance of the Bakhtiari chiefs and inspect the new trade route then being opened up through their country; to visit the Karun and examine the conditions of trade on it; and, lastly, to return through Luristan and study the possibility of the opening of a trade route through it to the north. Although the author does not claim to present any decidedly new information on the country, and eschews political questions, the book contains many interesting details on the land and its inhabitants, and throws a useful light on the present state of affairs in a region now attracting general attention.

Persia. *Petermanns M.* 48 (1902): 142. **Stahl.**
Die durch Nivellierung des Rescht-Teheraner Wegs erhaltenen Höhen. Von A. F. Stahl.

A table is given showing the figures obtained by previous observers, side by side with those determined (for 25 places) by levelling in 1900.

Persia. **Stuart.**
The Struggle for Persia. By Donald Stuart. London: Methuen & Co., 1902. Size 8 × 5, pp. x. and 268. *Portrait. Price 6s. Presented by the Publishers.*

Written by an avowed Russophobe, this work is largely political in character, but the account of the autumn journey from Russia to Teheran by the difficult mountain route *viâ* Tabriz is of some geographical interest, while a chapter is devoted to prospective railway development.

Turkey. *Asien* 1 (1902): 53–57, 95–98. **Warburg.**
Jüdische Ackerbaukolonieen in Anatolien. Von Prof. Dr. O. Warburg. *With Illustrations.*

Turkey—Aleppo and Adana. **Barnham and Massy.**
Trade of Vilayets of Aleppo and Adana for the year 1901. Foreign Office, Annual No. 2785, 1902. Size 9½ × 6, pp. 26. *Price 2d.*

Turkey—Asia Minor. *Die Natur* 51 (1902): 121–123, 137–139. **Schleiff.**
Wald und Waldwirtschaft im nördlichen Anatolien. Von V. Schleiff.

Turkey—Damascus. **Richards.**
Trade of Damascus for the year 1901. Foreign Office, Annual No. 2832, June, 1902. Size 9½ × 6, pp. 30.

Turkey—Kurdistan. *P.R.I.* 16 (1902): 640–655. **Percy.**
Turkish Kurdistan. By the Right Hon. Earl Percy.

Turkey—Palestine. **Macalister.**
Palestine Exploration Fund Quarterly Statement (1902): 227–232.
The History and Site of Gezer. By R. A. Stewart Macalister.

Turkey—Syria. **Drummond-Hay.**
Trade of Beirut and Coast of Syria for the year 1901. Foreign Office, Annual No. 2836, July, 1902. Size 9½ × 6, pp. 24.

Western Asia. *Asien* 1 (1902): 91–94. **Schlagintweit.**
Die Eisenbahnen im westlichen Vorderaisen. Von Major a. D. Max Schlagintweit. *With Map.*

AFRICA.

Abyssinia. *La G., B.S.G. Paris* **5** (1902): 401–430. **Bozas.**

Voyage au pays des Aroussi (Ethiopie méridionale). Par Vicomte du Bourg de Bozas. *With Map and Illustrations.*

See note in the August *Journal* (*ante*, p. 229).

Africa. *J. African S.* (1902): 444–451. **Stopford.**

A Neglected Source of Labour in Africa. By Colonel J. G. B. Stopford.

On the possible utilization of the African elephant.

British Central Africa. **Sharpe.**

Trade and General Condition of the British Central Africa Protectorate for the year 1901–1902. Foreign Office, Annual No. 2872, 1902. Size 9½ × 6, pp. 42. *Price* 2½*d.*

Cape Colony—Water-Supply. *P.I. Civil Engineers* **147** (1902): 308–323. **Ritso.**

Boring for Water in the Cape Colony. By B. W. Ritso.

Central Africa. *Rev. G.* **51** (1902): 97–108. **Dornin.**

La question musulmane dans le Centre Africain. Par Pierre Dornin. *With Map.*

Congo Basin. **Cornet.**

La géologie du bassin du Congo d'après nos connaissances actuelles (1897). Par J. Cornet. (Extrait du *Bulletin de la Société Belge de Géologie*, etc., Tome xii., 1898, pp. 31–53.) Brussels, 1901. Size 9½ × 6½.

Congo State. **Cornet.**

Notes sur des roches du Mont Bandupoi et du Haut Uellé. Par J. Cornet. (Extrait du *Bulletin de la Société Belge de Géologie*, etc., Tome xii., 1898, pp. 26–30.) Bruxelles, 1901. Size 9½ × 6½.

Congo State. **Whitehead.**

Trade of the Independent State of the Congo for the year 1901. (Summary.) Foreign Office, Annual No. 2818, 1902. Size 9½ × 6, pp. 10. *Price* 1*d.*

The exports from the Congo continue to increase; but rubber, which was exported to the value of over £1,700,000, forms nearly nine-tenths of the total.

Congo State—Katanga. **Lemaire.**

Mission Scientifique du Ka-Tanga. Journal de Route. Section Moliro—M'pwéto—Ka-Béça—Lofoï—Chutes Ki-Oubo. Par le Capitaine Lemaire Charles. Bruxelles: P. Weissenbruch, 1902. Size 13 × 10, pp. xii. and 344. *Illustrations. Presented by the Author.*

This is the first section of the route-journal kept from day to day by Captain Lemaire during the Belgian-Katanga expedition. Besides the incidents of the journey, it contains miscellaneous jottings on the methods of work employed, the productions of the country traversed, its inhabitants and their customs, the meteorological conditions, etc. A striking feature is the reproduction, in colours, of the sketches by M. Dardenne, the artist of the expedition, both of the landscapes and the animal and vegetable life of the country. The work will, when complete, be a valuable addition to our knowledge of Central Africa. Captain Lemaire's route-map (also in course of publication) is noticed elsewhere (p. 567, *infra*).

Egyptian Sudan. *Ann. G.* **11** (1902): 315–338. **Dyé.**

Le Bahr el Ghazal, notions générales sur la province, les rivières, les plateaux et les marais. Par A. H. Dyé. *With Maps and Illustrations.*

French Congo. **Ancel.**

Renseignements Colon., l'Afrique Française (1902): 79–94, 99–120.

La formation de la colonie du Congo français (1843–1882). Par Jacques Ancel. *With Map.*

French Congo. *Rev. Colon.* (1901): 319–351. **Bos.**

Rapport sur l'exploration de la Haute-Kotto. Par le Lieutenant Bos.

Some account of the journey was given in the *Journal* for January last (p. 89).

French Congo. **Wauters.**

Au Congo Français. Les bassins de l'Ubangi (Inférieur) and de la Sanga d'après les dernières découvertes. Par A. J. Wauters. Bruxelles: P. Weissenbruch, 1902. Size 10 × 7½, pp. 20. *Map. Presented by the Author.*

Reprinted from the *Mouvement Géographique*, Nos. 32, 33, 35, 1902.

French Guinea. *B.S.G. Marseille* **26** (1902): 95–97. **Devaux.**

Le Tankisso, affluent du Niger. Par Capitaine Devaux.

French West Africa. **Maistre.**

C. Maistre. La région du Bahr-Sara. I. Aspect du pays. II. Système hydrographique du Chari-Logone. Le Bahr-Sara ou Chari. III. Les Saras. Montpellier, 1902. Size 9 × 5½, pp. 38. *Presented by the Author.*

M. Maistre holds that the Bahr Sara (known in its upper course as the Wam) is the true head-stream of the Shari.

Gambia. ——

Gambia. Report for 1901. Colonial Reports, Annual No. 355. London, 1902. Size 9½ × 6, pp. 32.

German East Africa. *Globus* **82** (1902): 85–89. **Schieritz.**

Der Meruberg in Deutsch-Ostafrika und Seine Umgebung. Von Erwin Schieritz. Mit einleitenden und begleitenden Bemerkungen von Brix Förster. *With Illustrations.*

German Protectorate. *Beiträge Kolonialpolitik* **3** (1901–2): 617–631. **Schwabe.**

Die Verkehrsverhältnisse in den deutsch-afrikanischen Schutzgebieten. Vom Geh. Regierungsrat a. D. Schwabe.

Gold Coast. **Morris.**

Northern Territories of the Gold Coast. Report for 1901. Colonial Reports, Annual No. 357, 1902. Size 9½ × 6, pp. 22. *Price* 1½*d.*

The discovery of gold in the Northern Territories must lead, it is said, to the opening of the Volta to navigation. When this is done communication with Gambaga will be much facilitated, a good road having already been made thither from Salaga.

Kamerun. *Deutsch. Kolonialblatt* **13** (1902): 291–293, 313–315. **Hoesemann.**

Expedition des Stabsarztes Hoesemann längs der Südgrenze von Kamerun. *With Map.*

See note in the August *Journal* (p. 231).

Liberia. **Cromie.**

Trade of Liberia for the year 1901. Foreign Office, Annual No. 2875, 1902. Size 10 × 6. *Price* ½*d.*

It is hoped that something will at last be done to open up some portion of the republic through the operations of the Company known as the "West African Gold Concessions, Limited."

Madagascar. *B.S.G. Com. Paris* **24** (1902): 21–31. **Besson.**

L'avenir agricole des hauts plateaux de Madagascar. Par M. le Dr. Besson.

Madagascar. *B.S.G. Marseille* **26** (1902): 38–55. **Besson.**

Madagascar, pays Betsiléo et sud de l'île, conférence de M. le Dr. Besson.

Madagascar. *Rev. Scientifique* **18** (1902): 97–102. **Grandidier.**

Madagascar, ses habitants, sa faune et sa flore. Par M. Guillaume Grandidier. *With Illustrations.*

Morocco. **Maclean.**

Trade of Consular District of Dar-Al-Baida for the year 1901. Foreign Office, Annual No. 2791, May, 1902. Size 9½ × 6, pp. 30. *Price* 2*d.*

Natal. **Gray.**

Colony of Natal. Report on the Mining Industry of Natal for the year 1901. By C. J. Gray. Pietermaritzburg, 1902. Size 13½ × 8½, pp. 102. *Maps, Plates, Diagrams, etc.*

The output of coal in 1901 was in excess of any previous output, no doubt owing to the demand created by the war. Mining for other minerals was, however, more or less at a standstill.

Niger. *La G., B.S.G. Paris* **5** (1902): 451–461. **Lenfant.**

La navigabilité du bas Niger. Par Capitaine Lenfant.

The preliminary results of Captain Lenfant's ascent of the Niger were noticed in the *Journal* for December, 1901 (p. 623). The present paper gives fuller details.

Nigeria. ——

Southern Nigeria. Report for 1900. Colonial Reports, Annual No. 353, 1902. Size 9½ × 6, pp. 24. *Price* 1½*d.*

The total trade for the year exceeded £2,200,000, the exports exceeding the imports (apart from specie) by over £100,000.

North Africa. *B.R.S.G. Madrid* **43** (1901): 324-351. **Blázquez.**

Via romana de Tánger á Cartago. Por D. Antonio Blázquez. *With Map.*

North-East Africa. **Austin.**

Among Swamps and Giants in Equatorial Africa. An Account of Surveys and Adventures in the Southern Sudan and British East Africa. By Major H. H. Austin, C.M.G. London: C. Arthur Pearson, 1902. Size 9 × 6, pp. xii. and 354. *Maps and Illustrations. Price* 15*s. net. Presented by the Publishers.*

This will be reviewed elsewhere.

Portuguese West Africa. *B.S.G. Lisboa* **19** (1901): 471-501. **Cancella.**

Impressões de uma viagem ás Ilhas de S. Thomé e Principe. Pelo Dr. José Paulo Monteiro Cancella.

Sahara. *B. Comité l'Afrique Française* **12** (1902): 307-312. **Caix.**

La reconnaissance du lieutenant Cottenest chez les Hoggar. Par Robert de Caix. *With Map.*

On a journey south from Insalah, which revealed the existence of an easy route, east of those usually followed by caravans.

Sahara. *C. Rd.* **134** (1902): 1533-1536. **Flamand.**

Sur la présence du terrain carboniférien dans le Tidikelt (Archipel touatien), Sahara. Note de M. G. B. M. Flamand.

Sahara. *C. Rd.* **135** (1902): 212-214. **Flamand.**

Sur le régime hydrographique du Tidikelt (archipel Touatien), Sahara central. Note de G. B. M. Flamand.

South Africa—Irrigation. **Willcocks.**

Report on Irrigation in South Africa. By W. Willcocks. (In "Further Correspondence relating to Affairs in South Africa." July, 1902. Pp. 37-75. *Plans.*) London: Eyre & Spottiswoode, 1902. Size 13 × 8½.

Zanzibar—Agriculture. **Lyne.**

Government of H.H. The Sultan of Zanzibar. Annual Report of the Agricultural Department, 1901. Size 7½ × 6, pp. 32.

NORTH AMERICA.

Alaska—Boundary. *Contemporary Rev.* **82** (1902): 190-206. **Hodgins.**

The Alaska-Canada Boundary Dispute. By Thomas Hodgins.

The American view of this question has lately been given by Mr. Balch in the *Journal of the Franklin Institute* (vol. 153, pp. 161 *et seq.*). The present paper supports the Canadian view, and presents the facts in a somewhat different light. Stress is laid on the change of the expression "sea" in the draft treaty to "ocean" in the treaty as signed between Great Britain and Russia in 1825; on the refusal of Great Britain to accede to the 10-league limit, except as a qualification of the boundary as determined by the mountain range parallel to the coast; and on the express concession to Great Britain of free access to the ocean.

Canada—British Columbia. ———

Annual Report of the Minister of Mines for the year ending December 31, 1901, being an Account of Mining Operations for Gold, Coal, etc., in the Province of British Columbia. Victoria, B.C., 1902. Size 10½ × 7, pp. 915-1232d. and xxviii. *Map, Diagram, and Illustrations. Price* 50 *cents.*

The rapid development noted in the last report (*Journal*, vol. xviii. p. 624) has been fully maintained in 1901, the total output having risen from 16 to 20 million dollars. The chief increase is in lode gold and copper, the quantity of the latter being nearly three times as great in 1901 as in 1900.

Canada—Labrador. *B.G.S. Philadelphia* **3** (1902): 65-212. **Delabarre.**

Report of the Brown-Harvard Expedition to Nachvak, Labrador, in the year 1900. By E. B. Delabarre, PH.D. *With Maps and Illustrations.*

Cf. note in the August *Journal.*

Canada—Railway. *Scottish G. Mag.* **18** (1902): 486-488. **Begg.**

A Second Trans-Continental Canadian Railway. By Alexander Begg.

Mexico. *Deutsche Rundschau G.* **24** (1902): 481-486. **Lemcke.**

Im Reiche der Vulkane in Mexico. Von Heinrich Lemcke. *With Map.*

Australia—Meteorology. **Wragge.**

1902. Queensland. No. 1. Report on the Mount Kosciusko Observatory and Allied Stations. By Clement L. Wragge. 1898. Brisbane: G. A. Vaughan, 1902. Size 13 × 8½, pp. 26. *Charts and Illustrations.*

Australia—Year-Book. ——

The Year-Book of Australia for 1902. London, Sydney, etc. Not dated. Size 8½ × 5½, pp. lviii. and 832. *Maps. Price* 10*s.* 6*d. Presented by the Agent-General for New South Wales.*

New Caledonia. **Reichenbach.**

Trade of New Caledonia for the year 1901. Foreign Office, Annual No. 2891, 1902. Size 9½ × 6, pp. 12. *Price* 1*d.*

New South Wales. **Coghlan.**

New South Wales. Statistical Register for 1900 and previous years. Compiled from Official Returns by T. A. Coghlan. Sydney: W. A. Gullick, 1902. Size 10 × 6, pp. viii. and 1054. *Price* 5*s. Presented by the Agent-General for New South Wales.*

Oceania. *B.S.G. Lille* **37** (1902): 409–434; **38** (1892): 23–44. **Gallois.**

La France en Océanie. Par M. Eugène Gallois. *With Maps and Illustrations.*

Queensland—Darling Downs. **Morgan.**

The Discovery and early Development of the Darling Downs. By the Hon. Arthur Morgan. Size 9½ × 6, pp. 87–116.

Queensland—Geology. **Cameron.**

Queensland Gov. Mining J. **2** (1901): 420–421, 469–471.

Geological Observations in North-Western Queensland. By Walter E. Cameron. *With Illustrations.*

Queensland—Mineral Resources. ——

Mineral Resources of Queensland: containing a concise history of Mining in Queensland, with a description of the extensive Mineral Resources of the State, and of the wide field which they offer for investment. (*Queensland Government Mining Journal.* Special Number for the Glasgow International Exhibition.) Brisbane: Gordon & Gotch, 1901. Size 12½ × 10, pp. 66. *Maps and Illustrations.*

Tasmania. *Papers and P.R.S. Tasmania* (1900–1901): xxv.–xxxiii. **Beattie.**

Notes on a Trip to the Barn Bluff Country. By J. W. Beattie.

Tasmania. ——

Report of the Surveyor-General and Secretary for Lands for 1899–1900. Hobart: John Vail, 1900. Size 13 × 8½, pp. 54.

Ditto for 1900-1901. Pp. 48. *Map.*

POLAR REGIONS.

Antarctic—German Expedition. ——

Deutsche Südpolar-Expedition auf dem Schiff "Gauss" unter Leitung von Erich von Drygalski. Bericht über die wissenschaftlichen Arbeiten auf der Fahrt von Kapstadt bis zu den Kerguelen 27. November 1901 bis 2. Januar 1902 und die Thätigkeit auf der Kerguelen-Station bis 2. April 1902, mit Beiträgen von Bidlingmaier, v. Drygalski, Gazert, Ott, Philippi, Ruser, Vanhöffen, Werth. Heft 2, August 1902. (Veröffentlichungen des Instituts für Meereskunde und des Geographischen Instituts an der Universität Berlin.) Berlin: E. S. Mittler und Sohn. Size 10½ × 7½, pp. vi. and 74. *Charts and Illustrations. Presented by the Institute.*

This will be specially noticed.

Antarctic—Swedish Expedition. *Petermanns M.* **48** (1902): 138–140. **Wichmann.**

Die schwedische Südpolar-Expedition. Nach Briefen von Dr. O. Nordenskjöld und Leutnant Duse. Von H. Wichmann.

MATHEMATICAL GEOGRAPHY.

Astronomy. ——

Connaissance des Temps ou des Mouvements célestes, pour le méridien de Paris, à l'usage des Astronomes et des Navigateurs pour l'an 1903, publiée par le Bureau des Longitudes. (Pp. viii., 834, and 108.) Ditto 1904. (Pp. viii., 836, and 110.) Paris: Gauthier-Villars, 1900–1901. Size 9½ × 6. *Diagrams.*

Cartography. *G.Z.* 8 (1902): 65–80, 145–160, 204–222. **Peucker.**

Drei Thesen zum Ausbau der theoretischen Kartographie. Von Dr. Karl Peucker. *With Plate.*

Compass. **Bertelli.**

P. Timoteo Bertelli. Sulle Recenti Controversie intorno all' Origine della Bussola Nautica. (Estratto dalle Memorie della Pontificia Accademia Romana dei Nuovi Lincei, vol. xx.) Roma: Filippo Cuggiani, 1902. Size 11½ × 7½, pp. 52. *Presented by the Author.*

This will be noticed elsewhere.

Navigation. **Law.**

'Diagrams on Work Books v. Diagrams on Mercator Charts,' and 'A Short and Easy Method of finding the Centring Error of a Sextant.' By Edward Downes Law. (From the *Nautical Magazine* for 1902.) Size 9½ × 6. *Presented by the Author.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Glacial Deposits. *Rev. Scientifique* 18 (1902): 367–370. **Meunier.**

Les galets striés et les terrains d'origine glaciaire. Par Stanislas Meunier.

The writer considers that the extent of glacial deposits on the margin of the Alps and other mountain chains is commonly much exaggerated.

Ice-erosion. **Arçtowski.**

Note complémentaire au sujet de la discussion de la question de l'abrasion glaciaire. Par Henryk Arçtowski. (Extrait du *Bulletin de la Société Belge de Géologie*, etc. Tome xvi., 1902, pp. 61–63.) Size 10 × 6½.

Meteorology. *Sitzb. K.P.A.W. Berlin* (1902): 495–504. **Assmann.**

Ueber die Existenz eines wärmeren Luftstromes in der Höhe von 10 bis 15km. Von Prof. Dr. Richard Assmann.

Meteorology. *Meteorolog. Z.* 19 (1902): 260–269. **Hann.**

W. v. Bezold: "Ueber Klimatologische Mittelwerthe für ganze Breitekreise." Referat von J. Hann.

Oceanography. **Forch, Knudsen, and Sørensen.**

Mém. A.R. Sci., etc., Danemark 12 (1902): 1–152.

Berichte über die Konstantenbestimmungen zur Aufstellung der hydrographischen Tabellen von Carl Forch, Martin Knudsen, und S. P. L. Sørensen. Gesammelt von Martin Knudsen. *With Diagrams.*

Gives the results of determinations undertaken in response to a vote of the 1899 Conference on International Oceanographical research.

Oceanography. *Rev. Scientifique* 17 (1902): 545–555. **Thoulet.**

La circulation océanique. Par M. J. Thoulet.

Oceanography—Deposits. *Rev. Maritime* 154 (1902): 1155–1167. **Thoulet.**

Considérations relatives à l'analyse des fonds marins. Par J. Thoulet. *With Diagram.*

Physical Geography. *Naturw. Wochenschrift N.F.* 1 (1902): 385–391. **Günther.**

Der Erdkörper als Organismus; ein Beitrag zur Geschichte der Irrlehren in der physikalischen Geographie. Von Prof. Dr. Sigmund Günther.

Physical Geography. **Marchi.**

L. De Marchi. Trattato di Geografia Fisica. [Vol. Unico.] Milano: D. F. Vallardi, [1901]. Size 9½ × 6½, pp. xiv. and 510. *Maps and Illustrations. Price 15 lire. Presented by the Publisher.*

The first part treats of the internal forces which contribute to the formation of terrestrial relief in its broad outlines (continents and oceans, mountain systems, etc.); the second, of the external forces to which the individual surface forms are due. In the third, the forms themselves, their classification and evolution are dealt with. The author appears to be well acquainted with the results of modern research, and the book gives a comprehensive view of the present position of the science of geomorphology.

Physical Geography. *Geolog. Mag.* 9 (1902): 406–411. **Monckton.**

On some Examples of Marine and Subaerial Erosion. By H. W. Monckton. *With Illustration.*

Compares the marine platform at Gower and the surfaces of subaerial erosion in Surrey and Berkshire, with parallel features in Norway.

Phyto-geography. **Engler and Drude.**

Die Vegetation der Erde. Sammlung pflanzen-geographischer Monographien herausgegeben von A. Engler und O. Drude. Vols. i.–vi. Leipzig: W. Engelmann, 1896–1902. Size 10½ × 7. *Maps and Illustrations.*

This valuable series of monographs, brought out under the auspices of two of the leading authorities on the subject, will supply the student of botanical geography, in the modern conception of the term, with an indispensable basis of study. Each volume deals with the conditions of vegetation in a special region, and the titles of the recent issues are entered above, under the countries to which they refer.

Phyto-geography. *Scottish G. Magazine* 18 (1902): 406–413. **Hardy.**

A Note upon the Methods of Botanical Geography. By Marcel Hardy.

Insists on the importance of an analysis of the conditions of plant environment.

River-systems. *Globus* 82 (1902): 92–95. **Krebs.**

Wirkliche Wasserscheiden und fliegende Aufnahmen zu umfassender Orientierung über diese hydrologischen Verhältnisse. Von Wilhelm Krebs.

Urges the need of official hydrological surveys for the purpose of determining watersheds, and points out the way in which such can be carried out.

Terrestrial Magnetism. *Vidensk. Skrifter* (1901), No. 1: pp. 80. **Birkeland.**

Expédition Norvégienne de 1899–1900 pour l'étude des aurores boréales. Résultats des recherches magnétiques. Par Kr. Birkeland. *With Plates and Diagrams.*

A note on this will appear in the Monthly Record.

Tides. **Darwin.**

George Howard Darwin. Ebbe und Flut sowie verwandte Erscheinungen im Sonnensystem. Autorisierte Deutsche Ausgabe nach der Zweiten Englischen Auflage von Agnes Pockels. Mit einem Einführungswort von Prof. Dr. Georg von Neumayer. Leipzig: B. G. Teubner, 1902. Size 8 × 5½, pp. xxii. and 344. *Illustrations. Presented by the Publisher.*

The original English edition of this well-known treatise was reviewed in the *Journal* for 1899 (vol. xiii. p. 630). This translation, which has been made under Prof. Darwin's supervision, embodies the additional matter inserted in the second edition.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Guyot.**

Conférence Broca, 1901. Des Caractères de l'Évolution et de la Régression des Sociétés par M. Yves Guyot. (Extrait des Bulletins and Mémoires de la Société d'Anthropologie de Paris. Paris, 1901. Size 10 × 6½, pp. 20.

Historical—Columbus. **De la Rosa.**

La Solution de tous les problèmes relatifs à Christophe Colomb et, en particulier, de celui des origines ou des Prétendus Inspirateurs de la découverte du Nouveau Monde par M. Gonzalez de la Rosa. (Mémoire extrait du Compte rendu du Congrès international des Américanistes tenu en Septembre 1900.) Paris: E. Leroux, 1902. Size 10 × 6½, pp. 22. *Presented by the Author.*

To M. de la Rosa was originally due the theory as to the position of Toscanelli relatively to the discovery of America, which has since been developed by M. Vignaud (cf. *Journal*, vol. xix. p. 749). The two writers differ on some points, and M. de la Rosa here discusses some not considered by M. Vignaud.

Historical—Compass. *Riv. G. Italiana* 9 (1902): 281–298, 353–367, 409–424. **Bertelli.**

Sulle recenti controversie intorno all' origine della bussola nautica del P. Timoteo Bertelli.

Historical—Early Map. **Voynich.**

Supplement to the Eighth List of Books on Exhibition, by W. M. Voynich, 1, Soho Square, London, W. This Supplement consists of an unknown Map, with Inscription relating to the Magellan Expedition, and an unknown Portrait of Queen Elizabeth. June 10, 1902. Size 9½ × 6, pp. 957–958. *Facsimiles.*

See note in the September number (*ante*, p. 345).

Historical—Toscanelli. *Z. Ges. Erdk. Berlin* (1902): 498–511. **Ruge.**

Die Echtheit des Toscanelli-Briefes. Von Prof. Dr. Sophus Ruge.

A refutation of the main points of M. Vignaud's thesis.

Population. **Capitan and others.**

Rapports sur le Concours pour le Prix Bertillon 1901, par MM. Capitan, d'Échérac, G. Hervé, and Yves Guyot. (Extrait des Bulletins et Mémoires de la Société d'Anthropologie de Paris, 5^e Serie, Tome II. Fasc. 6, 1901.) Paris, 1901. Size 10 × 6½, pp. 42.

Analyses of various papers on the laws of population and kindred subjects.

BIOGRAPHY.

Dawson. **Ami.**

A Biographical Sketch of George Mercer Dawson. By H. M. Ami. Ottawa, 1901. Size 13 × 9½, pp. 32. *Portrait. Presented by the Author.*

GENERAL.

Bibliography. **Hellmann.**

Terrestrial Magnetism and Atmospheric Electricity 7 (1902): 63–66.

Zur Bibliographie von W. Gilbert's 'De Magnete.' Von G. Hellmann.

The writer shows that there were only three editions of Gilbert's famous book, one published in London, 1600, the others at Stettin in 1628 and 1633.

Bibliography. ———

Annales de Géographie. Onzième Bibliographie Géographique Annuelle 1901. Publiée sous la direction de Louis Raveneau (September 15, 1902). Paris: A. Colin. Size 10 × 6½, pp. 320.

British Empire. **Busching.**

Die Entwickelung der handelspolitischen Beziehungen zwischen England und seinen Kolonien bis zum Jahre 1860. Von Dr. Paul Busching. Stuttgart and Berlin: J. G. Cotta, 1902. Size 9 × 5½, pp. 244. *Tables. Price 7s.*

Statistical tables are given, showing the development of trade with the colonies from 1826 onwards.

Educational. *G.Z.* 8 (1902): 465–469. **Cauer.**

Ueber die Stellung des geographischen Unterrichts am Gymnasium. Vortrag von Paul Cauer.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from September 1 to 30, 1902.

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District map with hills, and printed in colours. 1*s.* folded in cover or flat in sheets. (Salisbury Plain.)

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25-inch—County Maps:—

Cambridgeshire, VII. 3; VIII. 13; XXIII. 9, 13, 14; XXV. 14; XXVI. 7, 8, 10, 11, 15; XXVII. 1, 5; XXIX. 1, 2, 4, 5, 6, 8, 9, 10, 13, 14, 16; XXX. 3, 4, 6, 7, 8, 10, 11, 13, 14; XXXIII. 11, 12, 15; XXXVI. 9, 13, 14; XXXVIII. 4, 16; XLII.

5, 6, 9; LII. 2, 15, 16. **Cardiganshire,** VIII. 12; XII. 11. **Dorsetshire,** XXII. 1, 5, 6; XXXVIII. 8, 12; XXXIX. 1, 2, 3, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16; XL. 10, 11, 12, 13, 14; XLVI. 4; XLVII. 2, 3, 4, 7, 8, 9, 10, 11, 12, 15, 16; LIII. 1, 2, 3, 5, 7, 9, 10. **Gloucestershire,** XXX. 14; XXXI. 11, 12, 15; XXXIV. 15; XXXVI. 1, 4, 5, 8, 15; XXXVIII. 3, 4, 6, 8, 12; XXXIX. 4; XL. 3, 4, 8; XLVII. 6, 16; XLIX. 7; LIX. 3, 6; LXI. 9. **Montgomeryshire,** XXIV. 14; XXXI. 1, 9; XXXVI. 12, 13, 14; XXXVII. 1, 2, 5; XLI. 11, 12, 13, 14, 16; XLII. 4, 5, 6, 7, 9, 10, 11, 12, 14; XLIII. 2, 3, 6; XLVI. 8, 12; XLVII. 4; XLVIII. 1. **Shropshire,** XXXIV. 10, 16; XXXV. 16; XXXVI. 11; XXXVII. 13; XXXIX, 14, 15; XL. 13; XLI. 4, 8, 12, 13, 14, 15; XLII. 4, 7, 8, 10, 12, 13, 14, 15, 16; XLIII. 1, 2, 3, 4, 8, 9, 10, 12, 13, 15, 16; XLIV. 2, 11; XLVII. 1, 9; XLIX. 3, 7, 10; L. 1, 2; LI. 2. **Staffordshire,** XXII. 6, 10; XXVIII. 1, 2; XXXV. 3, 8, 12; LXIII. 2, 3; LXXV. 5. **Suffolk,** XXXI. 9, 13, 14; XLII. 5, 6, 9. **Worcestershire,** IX. 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16; XV. 1, 2, 6, 7, 8, 9, 10, 11, 12. **Yorkshire,** CCXC. 2, 4, 5, 6; CCXCI. 12; CCXCVI. 14, 15; CCXCVII. 1, 2. 3*s. each.*

Miscellaneous Maps.

Petty Sessional Divisions in colour, ¼-inch scale, Carmarthenshire, Dorset. 6*d. each.* (*E. Stanford, London Agent.*)

England and Wales. **Geological Survey.**

Maps (1-inch). Old Series. Sheet 64 (Drift Edition). *Price* 8*s.* 6*d.*

England and Wales. **Bartholomew.**

Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheet 10, Lincoln Wolds. Edinburgh: John Bartholomew & Co. *Price* 2*s. Presented by the Publishers.*

France. **Barrère.**

France: Carte des rivières navigables et des canaux exécutés, en construction et projetés. Scale 1 : 1,390,000 or 21·9 stat. miles to an inch. Paris: Henry Barrère. 1902.

A useful map for general reference, showing navigability of rivers, canals, railways, &c., in different colours. There is an inset plan of the environs of Paris on an enlarged scale.

Hungary. **Direction Generale R. H. des Postes et des Telegraphiques, Budapest.**

Carte postale et télégraphique des Pays de la Couronne de Hongrie. Scale 1 : 400,000 or 6·3 stat. miles to an inch. 1902. 8 Sheets and Index. Budapest: La Direction Générale R. H. des Postes et des Telegraphiques. *Presented by Robert Kaye Gray, Esq.*

An outline map on eight sheets, each measuring 34 × 24 inches, showing postal and telegraph communications in the kingdom of Hungary. A full explanation is given of the symbols employed, from which it will be seen that a great deal of information can be obtained from the map concerning railways, roads, telegraphs, telegraph stations, and other similar matters. Administrative divisions are indicated, but—very properly in a map of this kind—no attempt has been made at hill shading.

United Kingdom. **Geological Survey.**

Summary of progress for 1901. 1*s.*

(*E. Stanford, London Agent.*)

ASIA.

Asia Minor. **Diest.**

Karte des nordwestlichen Kleinasien in vier Blättern, nach eigenen Aufnahmen und unveröffentlichtem Material auf Heinrich Kiepert's Grundlage neu bearbeitet. Von Walther v. Diest. Oberst a. D. Scale 1 : 500,000 or 7·8 stat. miles to an inch. Sheet D. Berlin: Alfred Schall. *Price* 5*m. each sheet.*

This is the south-east and concluding sheet of Colonel Diest's map of North-West Asia Minor in four sheets, and shows the railway between Eski-Shekir and Konia, with the surrounding neighbourhood. The whole map includes the area between 37° 30′ and 42° N. lat., and 26° and 33° E. long., and is compiled from the author's own surveys and unpublished materials, based upon Kiepert's well-known map of Western Asia Minor.

Asia Minor. **Kiepert.**

Karte von Kleinasien. Scale 1 : 400,000 or 6·3 stat. miles to an inch. Von Dr.

Richard Kiepert. Sheets: A. v. Ünie; D. iv. Adana. Berlin: Dietrich Reimer (Ernst. Vohsen), 1902. *Price 6m. each sheet.*

Including the above, there are now altogether seven sheets published of this excellent map of Asia Minor, which will, when finished, consist of twenty-four sheets. Dr. Kiepert is evidently sparing no pains to make the map as complete as available material will allow; and although, of course, it will be necessary to correct and add to the sheets from time to time as fresh information is forthcoming, yet until a complete survey is made there is no doubt that this will be the standard map of the country. The relative value of the material upon which the map is based is shown by the style of drawing and lettering.

AFRICA.

Africa. **Intelligence Division, War Office.**

Africa. Scale 1 : 250,000 or 3·9 stat. miles to an inch. (Egyptian Sudan.) Sheets: 55-E, Debba; 45-F, Merowe. (British Central Africa. Corrections and additions, June, 1902.) Sheets: (Provisional) 111-G, Dowa; (Provisional) 111-F, Fort Manning; (Provisional) 111-H, Fort Maguire; (Provisional) 111-K, Dedza Boma; (Provisional) 111-L, Mlangeni; (Provisional) 111-O, Kirk Mountains; (Provisional) 111-P, Blantyre; (Provisional) 117-D, Chiromo; (Provisional) 117-H, Sena. *Price 1s. 6d. each sheet.* Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. Sheets: 69, North-East Somaliland; 80, South-West Somaliland; 81, South-East Somaliland, 1901. *Price 2s. each sheet.* London: Intelligence Division, War Office; Stanford. *Presented by the Director-General of Mobilization and Military Intelligence.*

These all form part of the large map of Africa now being prepared by the Intelligence Division of the War Office. The sheets of the Egyptian Sudan and British Central Africa are revised editions of those published last year. Those of Somaliland, on the 1 : 1,000,000 scale, are new, and complete the north-east angle of the country.

British Central Africa. **Maitre and Langhans.**

Originalkarte der Reisen der "Weissen Väter" in Lobemba und Lobisa (Britisch Zentral-Afrika) 1899 und 1900. Nach den Entwürfen von Henri Maitre mit den Reisewegen und Aufnahmen früher Forscher vereinigt von Paul Langhans. Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. *Petermanns Geografische Mitteilungen*, Jahrgang 1902, Tafel 16. Gotha: Justus Perthes. *Presented by the Publisher.*

Congo Free State. **Lemaire.**

Atlas de 125 à 130 feuilles, donnant l'itinéraire détaillé parcouru par la Mission scientifique du Ka-Tanga. Scale 1 : 50,000 or 0·78 stat. mile to an inch. Part i. Sheets 1–27 and 84. Brussels: P. Weissenbruch, 1902. *Presented by Captain Ch. Lemaire.*

Captain Lemaire's journey from Tanganyika along the Congo-Zambezi watershed, during which the surveys forming the basis of these sheets have on several occasions been referred to in the *Geographical Journal*, and in the present number the scientific reports upon the survey are specially noticed. The present sheets consist of Nos. 1 to 27 and No. 84 of a large scale (1 : 50,000) map of the route followed by the expedition, which is altogether to consist of about 125 to 130 sheets, each measuring 21 × 28 inches. They are somewhat diagrammatic in appearance, but exhibit very clearly an amount of detail and information that could not be shown on a small scale, together with useful notes upon the character of the country, water obtainable, animal and vegetable life, and other subjects. Still a good proportion of each sheet consists of blank paper, and it would perhaps have been better, and certainly more convenient for reference, if the map had been drawn on a somewhat smaller scale than 1 : 50,000, and the longer notes printed at the sides with a reference number to indicate the exact spot to which they refer. A general map of the journey was published last year, in two sheets, on the scale of 1 : 1,000,000. The present map accompanies the narrative, which is now being published in parts.

Egypt. **Schweinfurth.**

Aufnahmen in der Östlichen Wüste von Ägypten von George Schweinfurth. I Serie (10 Blätter). Dritte Lieferung, Blatt 6. Die krystallinischen Küstengebirge am Roten Meere zwischen 26° 40′ u. 27° 31′ n. Br. Scale 1 : 200,000 or 3·1 stat. miles to an inch. Blatt 10*a*. and 10*b*. Die Wüstenregion zwischen Nil und Rotem Meer nördlich von der Keneh-Gosser Strasse zwischen 25° 50′ und 26° 50′ n. Br. Scale 1 : 200,000 or 3·1 stat. miles to an inch. Berlin: Dietrich Reimer (Ernst Vohsen). 1902.

The third portfolio of maps of this series, which has just been published, shows on sheet VI. the results of the surveys of Dr. Georg Schweinfurth in the Eastern Desert of Egypt, approximately between 26° 40' and 27° 30' N. lat., and between the Wadi Keneh and the Red Sea; and on sheets X*a*. and X*b*., the region between 25° 50' and 27° 30' N., and from the Nile at Keneh to the Red Sea. According to the index, there are only two other sheets required to complete the series. The basis of the map is the triangulation and route surveys conducted by Dr. G. Schweinfurth during the years 1877, '78, '84, and '85, and whenever other authorities have been utilized the fact is mentioned, and the explorer's name given. In addition to the topographical detail, many most useful and interesting notes are given respecting the geology and physical features of the country.

AMERICA.

Canada. **Surveyor-General's Office, Ottawa.**

Map of the Dominion of Canada and Newfoundland. Scale 1 : 2,217,600 or 35 stat. miles to an inch. 8 Sheets. Ottawa: Surveyor-General's Office, Department of the Interior, 1902. *Presented by the Surveyor-General of Canada.*

This is a most useful general map on eight sheets, each of which measures about 25 × 26 inches. It thus has the advantage of being sufficiently large to show a fair amount of detailed information without overcrowding. The rapid advance of the surveys of the more remote regions of the Dominion by different members of the Canadian Survey Department and others during recent years, will be seen by comparing this map with those of earlier dates. With few exceptions, the map may be taken as showing the latest information up to date of publication. It is clearly drawn and printed in colours, showing the different political divisions.

Canada. **Surveyor-General's Office, Ottawa.**

Sectional Map of Canada. Scale 1 : 190,080 or 3 stat. miles to an inch. Antler Sheet (52), West of Principal Meridian. Surveyor-General's Office, Ottawa, 1902. *Presented by the Surveyor-General of Canada.*

The area represented on this sheet, about 1300 square miles, lies just to the west of Manitoba, and to the north of the boundary between the United States and Canada. The sheet gives little detail, but is ruled into sections, and shows township numbers.

Guatemala. **Sapper.**

Die Ausbreitung des Erdbebens von Guatemala, April 18, 1902. Von Prof. Dr. Karl Sapper. Scale 1 : 1,750,000 or 27·6 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1902, Tafel 17. Gotha: Justus Perthes. *Presented by the Publisher.*

Peru. **Raimondi.**

Mapa del Perú por A. Raimondi. Scale 1 : 500,000 or 6·8 stat. miles to an inch. Sheets: 15A, 15B, 19A, 19B, 23A. Paris: Erhard F$^{\text{rès}}$.

These sheets include the forest area between 6° 10' and 10° 50' S. lat., and 61° 20' and 67° 10' W. long., extending on the east as far as the Rio Madeira. The boundaries between the various countries in this part of South America are far from being defined, and therefore it may be doubtful whether this region really belongs to Peru. There is little on the sheets except a few rivers, the course of which, as here laid down, can only be considered as very approximate.

United States. **U.S. Geological Survey.**

Geologic Atlas of the United States. Scale 1 : 125,000 or 1·8 stat. mile to an inch. Folio 76. Austin. Department of the Interior, United States Geological Survey, Charles D. Walcott, Director, Washington, D.C. *Presented by the U.S. Geological Survey.*

As is the case with the others of this series, this atlas consists first of a topographic map showing relief in brown contour lines at 25-feet intervals, next the historical geology sheet, which is on the same scale (1 : 125,000) as the former, and represents the same area, but shows the geological formation. After these follow two sheets of sections, and two plates of excellent photographic reproductions, illustrating characteristic geological features and fossils. The maps and plates are preceded by eight pages of explanatory text, and the whole atlas is most complete and instructive.

ARCTIC.

Greenland. **Stein.**

Einheimische Namen an der Küste von Nordgrönland von Cap York bis Smith Sound, von Robert Stein. Scale 1 : 1,200,000 or 18·9 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1902, Tafel 18. Gotha: Justus Perthes. *Presented by the Publisher.*

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during July and August, 1902. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
3275 m	= 4·0	Ireland, west coast:—Blacksod bay. 2*s.* 6*d.*
1458 m	= var.	Spain:—Ports and anchorages on the east coast of. Plans added:—Cullera anchorage, P. Dénia, Benicasim road, Columbretes islands. 1*s.* 6*d.*
3276 m	= 0·38 1·99	Balearic islands:—Iviza and Formentera islands and channel between Iviza and Espalmador. 1*s.* 6*d.*
3277 m	= 6·0	Balearic islands:—Ports San Antonio and Iviza. 1*s.* 6*d.*
3259 m	= 3·0	Newfoundland, east coast:—Green head to Little bay island. 2*s.* 6*d.*
3270 m	= 1·99	Newfoundland:—Head of Fortune bay, including Long harbour. 2*s.* 6*d.*
3204 m	= 1·8	United States, east coast:—New York bay and harbour. 2*s.* 6*d.*
3286 m	= 0·25	South America, east coast:—Rio de San Francisco do Norte to river Tariri. 2*s.* 6*d.*
3260 m	= 1·99	British Columbia:—Johnstone strait. 2*s.* 6*d.*
3284 m	= 3·98	India, west coast. Gulf of Kutch:—Salaya harbour. 2*s.* 6*d.*
3296 m	= 0·36 3·55	Eastern archipelago. Plans in Timor:—Koepang bay and approaches, Koepang road, Hansisi anchorage. 1*s.* 6*d.*
3294 m	= 6·0	Yang tse kiang:—Hankau. 1*s.* 6*d.*
3163 m	= 5·7	Japan, south-east coast:—Nipon island, Katsuura wan. 1*s.* 6*d.*
199		Adriatic:—Brindisi to Ortona. New plan:—Vieste.
421		Newfoundland:—Plans on the east coast of. Plan added:—Toulinguet harbours.
2141		Newfoundland, south coast:—Richards harbour to Ramea island. Plans added:—Heads of White Bear, Hare, and Recontre bays.
3016		Newfoundland, west coast:—Cow head to Rich point. Plan added:—Bad bay.
220		Newfoundland, north-west coast:—Savage cove to St. Barbe bay. Plans added:—Flower cove, St. Barbe harbour.
2923		Australia, east coast:—Hope islands to Turtle group. New plan:—Cook's passage.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
1187	Port Iviza. Plan on this chart.	New plan on sheet	3277
1465	Anchorages on the east coast of Spain.	New chart	1458
288	Toulinguet harbours.	New chart	421
935	Koepang bay. Koepang road. Coaling station anchorage on this sheet.	New chart	3296

Charts that have received Important Corrections.

No. 1828, England, east coast:—The Downs. 2693, England, east coast:—Orwell and Stour rivers. 2053, Ireland, south coast:—Kinsale harbour and Oyster haven. 2745, France, west coast:—Ile de Bas and adjacent coast. 710, Spain, Anchorages on the north coast:—Port Castro Urdiales. 2233, Black sea, Sheet IV.:—Sevastopol to Kertch strait. 2205, Black sea:—Kertch strait. 2978, Iceland:—Sigle fiord to Niardvig. 2979, Iceland:—Niardvig to Storksnœs. 2980, Iceland:—Storksnœs to Portland. 2042, North America, Gulf and River St. Lawrence:—Sydney harbour. 2579, Cuba, western portion. 495, Martinique:—St. Pierre roadstead. 892, South America, east coast:—Maceio to Rio de San Francisco do Norte. 24, South America, Chile:—Channels between Gulf of Trinidad and Gulf of Peñas. 2840, British Columbia:—Haro strait and Middle channel. 1835, British Columbia:—Clayoquot sound. 1844, Borneo:—Labuan island. 3148, Celebes:—Salabangka strait. 999, Gulf of Siam:—Menam Chau Fya or Bangkok river. 1258, Korea:—Approaches to Séoul. 2265, Japan:—Kobé and Hyogo bays. 1011, Russian tartary:—Eastern Bosphorus strait (Hamelin strait). 2130, Tasmania:—Port Davey. 2922, Australia, east coast:—Turtle group to Claremont point.

1896, New Zealand:—Auckland harbour entrances. 1423, New Zealand:—Port Nicholson.

(*J. D. Potter, Agent.*)

North Atlantic Ocean and Mediterranean Sea. **Meteorological Office, London.**

Pilot Chart of the North Atlantic and Mediterranean for October, 1902. London: Meteorological Office. *Price 6d. Presented by the Meteorological Office, London.*

United States Charts. **United States Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for September and of the North Pacific Ocean for October, 1902. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Bahr-el-Ghazal. **Hughes.**

Twenty-three photographs of the Bahr-el-Ghazal region, taken by Major H. M. Hughes. *Presented by Major H. M. Hughes.*

These are interesting photographs, especially as representing the Dinkas and other natives of the Bahr-el-Ghazal. They also give a good idea of the character of the country.

(1) Sudanese troops; (2) Dinkas; (3) Dinkas at Toug; (4) Dinkas at Wau; (5) Dinka Sheik and wives; (6) Dinka dug-out canoe; (7) Ivory war-horns of the Dinkas; (8) Jur woman carrying water; (9) Jur fisherman; (10) Jur boys at Wau; (11) Golo Sheiks and musical box; (12) Golo hut; (13) Golo family; (14) Sultan Tumbura, Niam Niam chief; (15 and 16) Niam Niam warriors; (17) Niam Niam coiffure; (18) Dhurra; (19) Forest at Wau; (20) Charge of Agai warriors; (21) Agai huts on piles; (22) *Balceinceps Rex*; (23) Native beehive, common all over the Bahr-el-Ghazal.

British Guiana. **Case.**

Seven photographs of British Guiana, taken by C. B. Case, Esq. *Presented by Frank J. Gray, Esq.*

A series of small platinotypes, specially interesting geographically from the fact that they show the different methods employed for protecting the foreshore from encroachments of the sea. The result of sedge-grass planting for this purpose is well exhibited. They are as follows:—

(1 and 2) Plantation Hope, Demerara: the foreshore, showing fascine protection works; (3 and 4) the foreshore, Golden Fleece, Essequibo; (5) Plantation La Bonne Intention, Demerara, showing main drainage canal and sluice; (6) Plantation Lusignan, Demerara; (7) Golden Fleece buildings (sugar factory), Essequibo.

Congo Region. **Grenfell.**

Twenty-nine photographs of the Congo Region, taken by the Rev. G. Grenfell. *Presented by the Rev. G. Grenfell.*

These photographs vary in size and merit, but some of them are decidedly good. They illustrate the features of the lower Congo region, the natives, and the work of the Baptist Missionary Society, in the cause of which the Rev. G. Grenfell has so long laboured—

(1) Steamer workshops, Bolobo; (2) Ngoie, chief of Bolobo; (3) Funeral dance, Bolobo; (4) Chief house, Bolobo; (5) The first installation of the Baptist Mission Society at Bolobo; (6) S.S. *Goodwill* on the slips at Bolobo; (7) Mission Station, Bolobo, Haut Congo: S.S. *Peace* on the slips; (8) Hauling up the s.s. *Peace* for repairs, Bolobo; (9) The s.s. *Peace* in front of the workshop, Bolobo; (10) Hus, the s.s. *Peace* pilot; (11) The first sternwheel steamer on the upper Congo, built by Yarrows; (12) The first steamer on the upper Congo, the *En Avant*; (13) View showing masonry of old city wall of San Salvador; (14) Herbert Ward and the remains of the Emin Pasha Relief Expedition rear guard, off Lukolela; (15) Native view of the Lulongo banks; (16) Bobangi trading flotilla, Lukolela; (17) Bobangi chief, attendant, and wives; (18) Bobangi women (early stage of civilization); (19) Bwela people; (20) Upoto man; (21 and 22) River Kwango above Kingunji; (23) Rapids of the Congo from the Leopoldville hill; (24) Houses at Bwela; (25) Congo railway at the confluence of the Mpozo river with the main stream; (26) The prison, Basoko; (27) Stanley Falls; (28) Lupu, chief of Banalya, upper Aruwimi; (29) Street, Banalya, upper Aruwimi.

Tahiti. **Homes.**

Four photographs of the Cook Memorial in Tahiti, with plate sent out by the

Royal Society and Royal Geographical Society, 1901, taken by F. Homes, Esq. *Presented by R. T. Simons, Esq., H.B.M. Consul, Tahiti.*

It will doubtless be remembered that last year this Society, in conjunction with the Royal Society, decided to send an inscribed plate to be placed upon the Cook memorial, at Tahiti, which had been restored, and which commemorates the observation of the transit of Venus near this spot by the famous navigator on June 3, 1769. These photographs show the memorial as restored, with the plate attached.

(1) Point Venus lighthouse, Cook's memorial on the left; (2) Cook's memorial restored, general view; (3) Royal Society and Royal Geographical Society's plate; (4) Matavai bay, Captain Cook's favourite anchoring-place in Tahiti.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

ORDNANCE SURVEY MAPS.

The following is a list of the various Ordnance Survey Maps of the British Isles on sale to the public, together with the prices. E. Stanford, 12, 13 and 14, Long Acre, W.C., is the London agent; there are also provincial agents in most of the important towns of England, Scotland, and Ireland. In places where no agent exists, the maps can be obtained through the principal local post offices.

¼-inch Scale.

	Price per sheet.	
	s.	*d.*
1. England and Wales, engraved in black, latitude and longitude marked, no hill shading or contours. Size 22½ × 15 inches. On paper	1	6
2.*England and Wales, engraved. Printed from a transfer from copper, hills in brown, roads sienna, water blue, woods green. Size 22½ × 15 inches. On paper	1	6
3.*Scotland, engraved. Printed from a transfer from copper, with water in blue, latitude and longitude marked, no hill shading or contours. Size 18 × 12 inches. On paper	1	0
4.*Scotland, engraved. Printed from a transfer from copper, hills in brown, roads sienna, water blue, woods green. Size 18 × 12 inches. On paper	1	0
5.*County and District Maps of Great Britain, cheap edition, roads in brown, latitude and longitude marked, on thin paper or folded in covers. In sheets. Unmounted . . . . *6d.* and	1	0
Folded in covers . . . . *9d.* and	1	0

1-inch Scale.

6. England and Wales, old series, in black, with outline and hill hachures.		
Size 36 × 24	2	6
Size 18 × 12	1	0
7. Ditto, new series, outline, contours in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
8.*Ditto, hills hachured in brown, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
9.*Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
10.*Ditto, hills hachured in brown, contours red, roads sienna, water blue, magnetic variation shown, latitude and longitude not marked. Size		

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* Publication in progress.

	Price per sheet.	
	s.	d.
18 × 12 inches. On linen-backed paper, either flat (with a few exceptions) or folded in covers. Single sheets	1	0
Combined sheets	1	6
11. Scotland, outline and contours in black, latitude and longitude marked. Size 24 × 18 inches. On paper	1	9
12.*Ditto, hills hachured in brown, and black contours, latitude and longitude marked. Size 24 × 18 inches. On paper	1	6
13. Ireland, outline, not contoured, in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
14.*Ditto, outline, not contoured, in black, latitude and longitude marked, showing county, rural, urban, and county borough boundaries in red. Size 18 × 12 inches	1	0
15. Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
16.*Ditto, hills hachured in brown, roads sienna, water blue, woods green, latitude and longitude marked. Size 18 × 12 inches. On linen, backed paper, either flat or folded in covers	1	0
17.*Combined maps of areas round certain large towns, or other areas, such as the New Forest and Lake District, and published in various forms and sizes. These maps usually show outline and contour in black and roads in brown. In sheets, unmounted . . . . . . *9d.* to	1	0
Folded in cover . . . . 1*s.* to	1	6
6-Inch Scale.		
18. Great Britain, water coloured blue or back lined, contours in black, latitude and longitude marked.		
Heliozincographed or photozincographed. Size 18 × 12 inches . .	1	0
Engraved or photozincographed (where not published in quarter sheets). Size 36 × 24 inches	2	6
19. Ireland, engraved or heliozincographed, contours in black, latitude and longitude not marked. Size 36 × 24 inches	2	6
$\frac{1}{2500}$ Scale.		
20. Houses ruled in black, water blue or back lined, latitude and longitude not marked. Size 38 × 25½ inches	3	0
21. Houses red, water blue, roads brown, latitude and longitude not marked. Unrevised editions only coloured in this form. Size 38 × 25½ inches. From 2*s.* 6*d.* to 23*s.*, according to the amount of colouring. This form is gradually being superseded by 20.		
Town Scales.		
22. $\frac{1}{500}$ scale, houses stippled. Size 38 × 25½	2	6
23. Ditto, houses ruled. Size 38 × 25½	2	6
24. Ditto, houses red, water blue, roads brown. Size 38 × 25½ inches. From 2*s.* 6*d.* to 15*s.*, according to the amount of colouring. Applies to unrevised only.		
25. 5-feet scale, houses stippled. Revised. Size 36 × 24 inches	2	6
Index Maps.		
26. Indexes to the sheets of the 1-inch scale maps of England and Wales, Scotland, and Ireland, scale 30 miles to an inch. Sizes about 18 × 13 inches	0	2
27.*Index to the sheets of the 6-inch scale map, parishes coloured.		
England and Wales. Size 18 × 12 inches	1	0
Scotland. Size 24 × 18 inches	1	9
28.*Index to the sheets of the 1 : 2500 scale map, parishes coloured.		
England and Wales. Size 18 × 12 inches	1	0
Scotland. Size 24 × 18 inches	1	9

Nos. 27 and 28 are identical with Nos. 7 and 11, but with sheet lines added, printed on thin paper, and coloured to show civil parishes.

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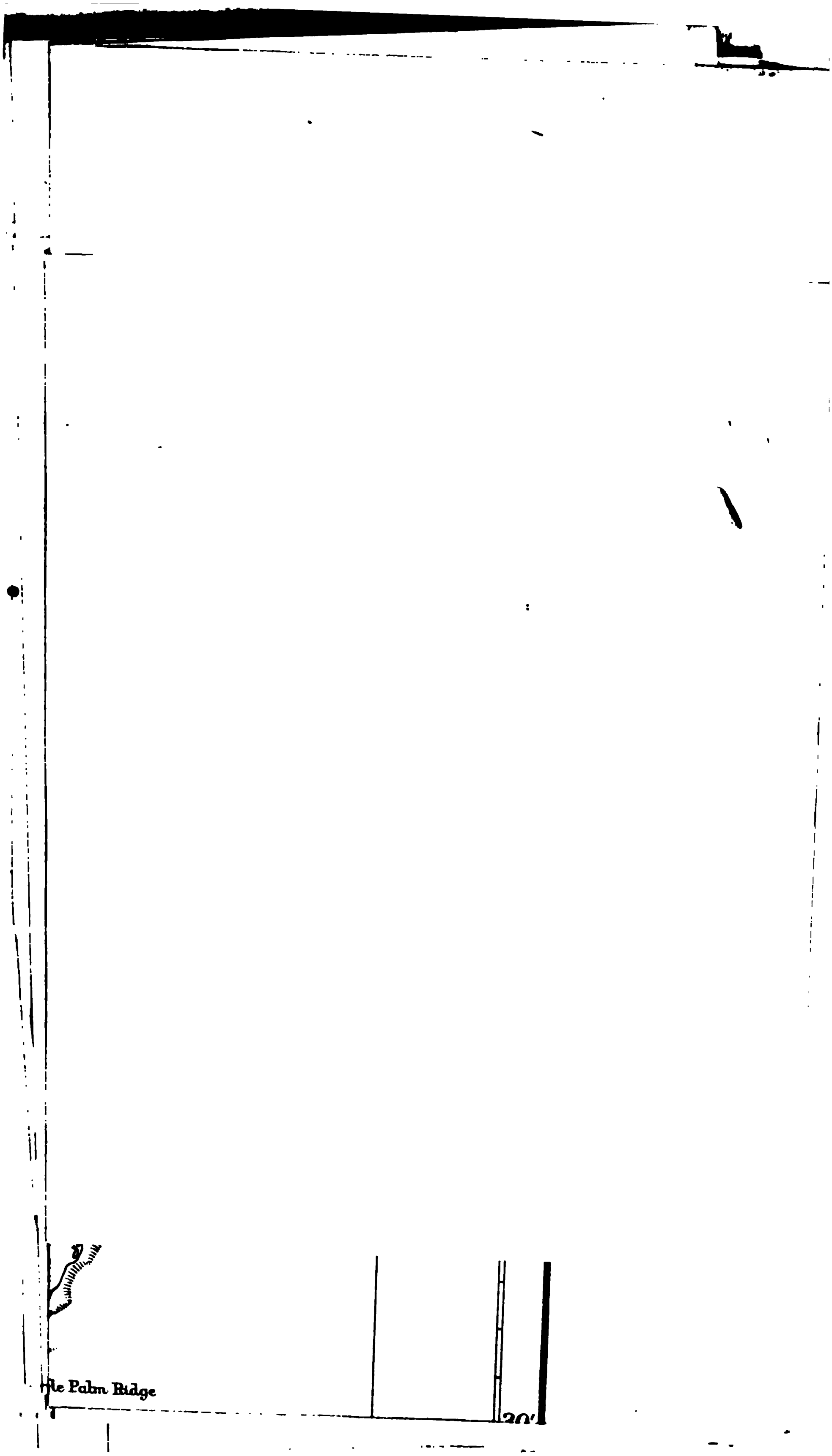
* Publication in progress.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The

Geographical Journal.

No. 6. DECEMBER, 1902. VOL. XX.

THE PRESIDENT'S OPENING ADDRESS, SESSION 1902-1903.*

SINCE the final meeting of our last session several events of interest have taken place, some of which have rejoiced the hearts of all loyal subjects of our King, while others have favoured the advancement of geographical knowledge. The recovery of his Majesty from his dangerous illness and the happy event of the Coronation were a source of joy and gladness to us all, while geographers had special cause for remembering the interest his Majesty has always taken in our work. At the same time the assembly of loyal subjects and visitors from every part of the world takes our thoughts back to the originating cause of such a gathering, which, as we all know, is primarily due to the geographical exploration and discovery of our countrymen in former days.

The pacification of South Africa is another cause for rejoicing, and especially to geographers, because the hindrances to geodetic operations and to surveys have been finally swept away.

Another great event of interest to geography is the completion of the All-British Pacific Telegraph Cable at Suva, in the Fiji Islands, on the 31st of last month. A message can now be sent round the world in *thirty minutes*, the land part being entirely in British territory. The dream of Shakespeare is thus more than realized, for Puck only said he'd put a girdle round the Earth in *forty minutes*. These telegraphic undertakings and the researches to which they give rise are of great importance to the oceanographic branch of our science.

His Majesty, as our patron, has taken a most kindly interest in our Antarctic expeditionary work, including the despatch of a relief ship, and has desired that he may be kept informed of all the news that may be received respecting our explorers. The *Morning* left the Thames on

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* Read at the Meeting of the Society, November 11, 1902.

July 9, and was spoken on August 23. The news of her arrival at Lyttelton may be expected at any moment. But we cannot look forward to any tidings of the *Discovery* until April or May at the earliest. Meanwhile, very interesting accounts of the researches of the Swedish expedition to Graham island have been received from Dr. Gunnar Andersson.

The Scottish Antarctic Expedition, in the *Scotia*, under the leadership of Mr. Bruce, left Kingstown on November 8 for the Falkland Islands; I am sure we all wish it every success.

The return of our vice-president, Sir Thomas Holdich, from his important geographical labours connected with the arbitration of the frontier between Chile and the Argentine Republic took place last month. Valuable results will accrue to our science, but it is necessary that we should wait for them until all questions relating to the arbitration are finally settled.

The return of Captain Sverdrup and Commander Peary from the Arctic Regions is a subject for rejoicing, for they had been long absent. With Peary there had been annual communication, but Sverdrup and his companions had not been heard of for three years. Their geographical results are highly important, and, in my opinion, complete the solution of the Arctic problem. We hope to welcome Captain Sverdrup and his geologist, Mr. Schey, at one of our meetings in February, when I trust there will be a full discussion of Arctic geography in its general aspects, in which, I am not without hopes, our associate and gold medallist, Fridtjof Nansen, may take part. I may mention that a modest Arctic expedition is now being fitted out in Norway, by Mr. Raoul Amundsen, who was in the Belgian Antarctic Expedition. His object is to take observations at and near Ross's north magnetic pole for a lengthened period. His vessel is a cutter of 47 tons, with petroleum motor power and a crew of eight men, called the *Gjöa*. He will start next spring.

Dr. Sven Hedin, who returned from his latest travels in Central Asia during the summer with an extraordinarily rich harvest of fresh geographical information both in Eastern Turkestan and Tibet, has promised to be with us in December, and we shall give our distinguished colleague a cordial reception.

Turning to our educational efforts, while the Oxford School of Geography is progressing, it is very satisfactory to find that geography is included among the subjects for the matriculation examination at the University of London. It is not obligatory, but it is placed on the same footing with history, logic, and biology. From the Birmingham University Calendar I gather that geography has been conceded a place in the faculty of science. We may look forward with some confidence to the excellent effect that these arrangements, made by the authorities of the London and Birmingham Universities, will have on the teaching of geography in the secondary schools throughout the country. Our own system of instruction, under the able guidance of Mr. Reeves, is bearing excellent fruit, I am glad to say, both as regards the number of those seeking instruction, and the character of the instruction itself.

I have always endeavoured to arrange that, in addition to the narratives of explorers, the subjects of papers at our meetings should include general reviews of progress in the various departments, as well as disquisitions on general results, and on the phenomena, the consideration of which is included in our science. Our present session will be opened with a paper of this kind; and I feel sure that you will find that Prof. Milne * will make his remarks on world-shaking earthquakes both interesting and instructive.

A JOURNEY OF GEOGRAPHICAL AND ARCHÆOLOGICAL EXPLORATION IN CHINESE TURKESTAN.†

By M. A. STEIN, Ph.D., Indian Educational Service.

In June, 1900, the Government of India placed me on a year's special duty in order to enable me to carry out a long-cherished plan of archæological explorations in the southern portion of Chinese Turkestan, and particularly in the region of Khotan. Many previous antiquarian tours in Kashmir, the Punjab, and on the fascinating ground of the North-West Frontier of India, had taught me the necessity of close topographical observation as an important adjunct of historical research in those fields towards which, as an Indian archæologist, I felt most attracted. It was hence clear to me that the task awaiting me in Chinese Turkestan would have to comprise also surveying operations such as are required for the accurate fixing of the position of ancient sites, and generally for the elucidation of the historical topography of the country. But in addition I was anxious from the first to avail myself of the opportunities the journey might offer for geographical work of a more general character in regions that had so far remained without a proper survey or altogether unexplored.

The generous aid accorded to me by the Indian Survey Department made it possible to carry on a continuous system of surveys, by plane-table, astronomical observations and triangulation, throughout the course of my journey. Its results have been embodied in maps which are shortly to be published by the Trigonometrical Branch of the Survey of India. These maps, as well as the Detailed Report of my explorations on which I am at present engaged under the orders of the Indian Government, will, I hope, show that I have spared no efforts to utilize the opportunities offered to me in the interest of geographical science.

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* This paper will be published in a future number.

† Read at the Royal Geographical Society, June 16, 1902. Map, p. 680.

In the mean time, it is a source of sincere gratification to me that I am enabled, by the courtesy of your Council, to place this succinct account of my journey and labours before the Royal Geographical Society, which, since the days of those great scholars, Sir Henry Rawlinson and Sir Henry Yule, has done so much to clear the way for the critical study of the ancient geography of India and Central Asia.

The plan of archæological explorations about Khotan, and of the journey that was to lead to them, was first suggested to me in the spring, 1897, by a series of remarkable antiquarian acquisitions from that region. Among the papers left behind by that distinguished but ill-fated French traveller, M. Dutreuil de Rhins, there were found fragments of ancient birch-bark leaves, which had been acquired in the vicinity of Khotan, and which proved to contain a Buddhist text in an early Indian script and language. On publication they were soon recognized as the oldest then known Indian manuscript, going back to the first centuries of our era. About the same time the "British collection of Central-Asian antiquities," which had been formed at Calcutta with the assistance of the Government of India in the Foreign Department, and under the care of Dr. Hoernle, the eminent Indologist, received from the same region very notable additions consisting of manuscripts, ancient pottery, and other remains. These objects had been sold to the political representatives of the Indian Government in Kashgar, Kashmir, and Ladak as finds made by native "treasure seekers" at ancient sites near Khotan and in the neighbouring portions of the Taklamakan desert. A curious feature of these acquisitions was that, besides undoubtedly ancient documents in Indian and Chinese characters, they contained a large proportion of manuscripts and "blockprints" in a surprising variety of entirely unknown scripts. While the materials thus accumulated, no reliable information was ever forthcoming as to the exact origin of the finds or the character of the ruined sites which were supposed to have furnished them.

No part of Chinese Turkestan had as yet been explored from an archæological point of view, and, however much attention these discoveries attracted among competent European Orientalists, it was evident that their full value for the ancient history and culture of Central Asia could never be realized without accurate researches on the spot. The practicable nature of such investigations was proved by the memorable march which Dr. Sven Hedin had made in the winter 1895–96 through the Taklamakan desert north-east of Khotan, and of which the first accounts reached me in 1898. It had taken the famous Swedish explorer past two areas of sand-buried ruins, and, though his necessarily short halt at each had not permitted of any exact evidence being secured as to the character and date of the ruins, this discovery amply sufficed to demonstrate both the existence and comparative accessibility of ancient sites likely to reward excavation.

In the summer of 1898 I was able to submit the detailed project of my journey to the Indian Government, whose sanction and assistance were indispensable for the practical execution of my plan. Generously supported first by the Hon. Sir Mackworth Young, late Lieut.-Governor of the Punjab, and subsequently, on my temporary transfer to Bengal, by the Hon. Sir John Woodburn, my proposals met with favourable consideration on the part of the Supreme Government. According to the final scheme, which in July, 1899, received the sanction of the Government of India in the Department of Revenue and Agriculture, I was deputed on special duty to Chinese Turkestan for the period of one year, and was allowed a grant of £600 (Rs. 9000), intended to meet the estimated expenditure on the journey and explorations. It was solely through the consideration and material aid thus liberally accorded to me that I was able to undertake and carry to a successful issue the scientific enterprise I had planned. I therefore feel it my duty publicly to record here my deep sense of gratitude to the Government of India, which, under His Excellency the present Viceroy, Lord Curzon, have never failed to encourage and support researches bearing on ancient India and the regions that once belonged to the sphere of its cultural influence.

The practical preparations for the journey, which occupied much of my time and attention during the winter 1899–1900, were greatly facilitated by the liberal assistance accorded to me by Colonel St. George Gore, Surveyor-General of India. With a view to the proposed geographical work, he kindly agreed to depute with me one of the native sub-surveyors of his department, and to provide the necessary equipment of surveying instruments, together with a special grant intended to cover the additional expenses arising from the employment of the sub-surveyor. Babu Ram Singh, the sub-surveyor selected, had accompanied Captain Deasy during the latter part of his recent explorations in Chinese Turkestan, and the local experience thus acquired by him made his services particularly useful for the purposes of my own journey. Among my personal preparations, I may mention the study of Eastern Turki, the language of Chinese Turkestan. I was able to acquire a fair practical knowledge of it while still in India, with the help of a Kokandi servant, honest Mirza Alim, whom I had engaged at Peshawar, and who subsequently followed me to Kashgar.

By the middle of April, 1900, I was at last able to leave steamy and over-civilized Calcutta for Kashmir, where I completed the outfit and transport arrangements needed for my camp. The many tours I had made during previous years through the mountains in and about Kashmir had furnished me with sufficient practical experience to enable me to anticipate with fair accuracy the conditions of transport and supplies on a great part of the travels before me. The Government of India had granted me permission to use the route through Gilgit and Hunza for the journey to Kashgar, which was to form my proximate goal. By the end of May the snow on the mountain ranges between Kashmir and Gilgit had melted sufficiently to make the attempt of crossing the passes with laden animals just practicable. By that time, too, the sub-surveyor's little party, and another Turki servant sent by Mr. Macartney, the British political agent in Kashgar, had joined me, and all requisite stores and equipment had been duly collected and packed. Owing to the quantity of scientific instruments, photographic glass plates, etc., to be carried, and to the provision that had to be made for stores of all kinds in view of the distances likely to separate us thereafter from civilized "bases of supply," my caravan numbered sixteen baggage animals when it set out on the morning of the 31st May from Bandipur, the little port on the Volur lake and the starting-point of the "Gilgit Transport Road."

Though the snow still lay deep and the weather was trying, the Tragbal and Burzil passes (approximately 12,000 and 13,000 feet above the sea, respectively) were crossed without mishap. Pushing on by rapid marches through the Dard valleys of Astor, imposing in their barren grandeur, and across the rock-bound bed of the Indus near Bunji, we reached the Gilgit cantonment on June 11. Fresh transport arrangements necessitated a short halt at this last outpost of Anglo-Indian civilization. Thanks to the kind offices of Captain J. Manners Smith, V.C., C.I.E., then Political Agent, Gilgit, I was there able not only to make good various small defects in the equipment of my caravan, but also to collect interesting information concerning the customs and traditions of the Dard population inhabiting these valleys. The Dards deserve, indeed, to be treated with respect by the historical student and ethnographist; for their tribes have clung to this forbidding ground of bleak rocky gorges and ice-crowned ranges ever since the days of Herodotos. Ancient, like the mountains themselves, looks the race, with its sharply defined ethnic characteristics and language.

On June 15 I started from Gilgit filled with a grateful recollection of the kind help and hospitality which I had enjoyed among the last British officers I was to see for some time. Marching round the mighty buttresses of Mount Rakiposhi (with its highest needle-like peak soaring to an elevation of over 25,000 feet) and through mountain scenery that under a sky of dazzling clearness looked as grand as any I have ever seen in the Himalaya, we passed on the third day into the territory of the chiefs of Hunza and Nagir. Close to the hill-fort of Nilth, famous for the brilliant little campaign of 1891, I visited with interest the deep-cut gorge descending from a glacier of Rakiposhi, where Captain Manners Smith climbed the most precipitous cliffs with his handful of Gurkhas and Dogras, and finally breaking the resistance of the Kanjuti hillmen, won his Victoria Cross. It was pleasant to note that the brave mountaineers who were vanquished here look back upon this daring exploit of their quondam foe and conqueror with almost as much pride as if it had been performed by their own side. A short distance higher up the valley, near the village of Thol, I noticed a well-preserved little Stupa, a monument of those early centuries when this secluded valley, like the rest of the difficult hill-tracts further west, held a population attached to Buddha's faith. Was it the same small Kanjuti race, puzzling by its complete isolation in regard to language and ethnic origin, which now occupies Hunza?

At Aliabad, near the capital of the Hunza chief, I spent two days busily occupied with the rearrangement of all loads for transport by coolies; for the difficult mountain tracks by which alone the Taghdumbash Pamir can be approached during the summer months, from the side of Hunza, are absolutely impassable for any beast of burden. Acting on the instructions kindly sent in advance by the Political Agent, Gilgit, Wazir Humayun, the energetic chief adviser of Muhammad Nazim, the present Mir of Hunza, had made ample preparations for the trying route ahead. It was difficult to realize that this little mountain chieftainship was, until ten years ago, by reason of the freebooting and slave-raiding expeditions which it sent forth—and Wazir Humayun himself had led more than one successful raid of this kind—the terror of all neighbouring regions.

On June 20 I moved my camp to Baltit, where I paid a return visit to the Mir, in his old and highly picturesque castle. I was interested to note, in the carved woodwork of mosques and other structures, decorative elements of ancient Indian type, while in the furniture and fittings of the Mir's residence modern Central-Asian and Chinese influences were plainly discernible. On the following day we commenced on foot the series of trying marches up the gorge of the Hunza river. The winter route, which crosses the river-bed at frequent intervals, had become wholly impracticable, owing to the melting snows and the swollen state of the river. The precipitous mountain spurs and the great glaciers descending to the left bank of the river had daily to be crossed by tracks which may rightly be described as a succession of Alpine climbing tours of a decidedly tiring nature. They often led over narrow rock-ledges and by rough ladder-like galleries (*rafik*) along the faces of cliffs, where the carrying of loads would be nervous work for any but such extraordinarily sure-footed and active hillmen as the people of Hunza. Frequent enough were the places where even my little fox-terrier, accustomed to rough climbs from many a tour with his master, had to be picked up and carried.

Toiling along these precipices, amidst scenery truly inspiring in its rugged splendour, I was often reminded of the vivid accounts which Fa-hien and other ancient Buddhist pilgrims from China have left us of their experiences on the journey through the gorges of the Indus. From Ghulmit, the second stage onwards, the scanty settlers occupying the few patches of cultivated ground in the valley proved to be of Iranian origin, speaking a Wakhi dialect closely allied to that which is used by the Wakhan immigrants found in Sarikol. Thus, in this part of the Hindukush, too, the line of contact between the great areas of the Indian and Iranian families of language does not completely coincide with the geographical watershed.

After six days spent in more or less continuous climbing, Misgar, the northernmost hamlet of Hunza, was reached, where I was able to discharge the hardy hillmen who had carried our *impedimenta* without the slightest damage over such trying ground. On June 28, at last I crossed by the Kilik pass (*circ.* 15,800 feet above the sea) into Chinese territory on the Taghdumbash Pamir, using the Yaks of the Sarikoli herdsmen, who, by Mr. Macartney's arrangement with the Chinese authorities, had awaited me at the southern foot of the pass.

From Köktörök, our first camp on the Taghdumbash, at an elevation of over 14,000 feet, we commenced our plane-table survey, on the scale of 8 miles to the inch. Throughout our travels in the mountains I endeavoured to supplement it as far as my limited time permitted, by photogrammetric work, for which I used the excellent Bridges-Lee photo-theodolite kindly lent to me by Mr. Eliot, the head of the Indian Meteorological Department. Systematic triangulation by theodolite was started at the same time with the help of the points supplied by the Surveys of the Boundary Commission and Captain Deasy, while regular astronomical observations for latitude were made by Babu Ram Singh from here onwards at all camps, the exact determination of which possessed topographical interest. The constant and direct supervision which I exercised over the plane-table work, enabled me to pay special attention to the local nomenclature. A good deal of philological and historical interest attaches to the latter in regions like the Pamirs and a considerable portion of Chinese Turkestan, over which have passed the waves of great ethnic migrations. I believe, therefore, students interested in this part of Central-Asian geography will derive some advantage from the pains I took to correctly ascertain and to record with phonetic accuracy all local names throughout the territories covered by our surveys.

From the height of the Khushbel peak, the first "hill-station" of our survey (close on 17,000 feet above the sea), I could simultaneously see the ranges which form the watershed between the drainage areas of the Indus, the Oxus, and the Yarkand river, and which politically divide the territories of British India, Russia, and China, Afghanistan (Fig. 1). Pressed for time as I necessarily was in regard to all that touched my topographical interests, I could not resist the temptation of pushing westwards, at least as far as the Wakhjir pass, which leads from the Taghdumbash Pamir to the headwaters of the Oxus. Camping close to the summit of the Wakhjir pass (*circ.* 16,200 feet), I visited on July 2 the head of the Ab-i Panja valley, near the great glaciers which Lord Curzon first demonstrated to be the true source of the river Oxus. It was a strange sensation for me in this desolate mountain waste to know that I stood at last at the eastern threshold of that distant region, including Bactria and the Upper Oxus valley, which, as a field of exploration, has attracted me ever since I was a boy. It was the threshold only I had reached, and I knew that this time there was no entrance for me into the forbidden land. Notwithstanding its great elevation, the Wakhjir pass and its approaches, both from the west and east, are comparatively easy. Comparing the topographical features with the itinerary indicated by Hiuen Tsiang, the great Chinese pilgrim, I am led to conclude that the route which he followed when travelling about A.D. 649, on his return from India, through the valley of Pa-mi-lo (Pamir) into Sarikol, actually traversed this pass.

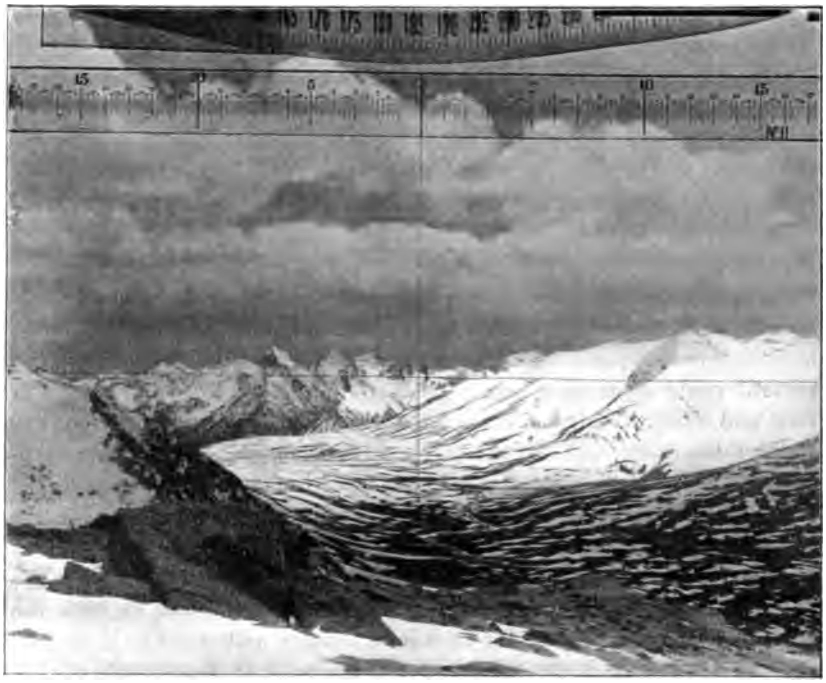

FIG. 1.—PHOTO-THEODOLITE VIEW OF KILIK PASS, FROM KHUSHBEL PEAK.

As I marched down the gradually widening valley of the Taghdumbash Pamir towards Tashkurghan, the chief place of the Sarikol district, I fully realized the contrast which its expanses of comparatively rich grazing offer to the rocky destitution of the Hunza gorges. Increasing numbers of nomadic herdsmen, both Kirghiz and Wakhi, now frequent the valley, which was an utterly deserted waste, and rarely used, even as a route, while there were Hunza raiding-parties ready to swoop down from the mountain fastnesses southwards.

I also felt glad to be once more on the track of Hiuen Tsiang, whose footsteps I had traced to so many a sacred Buddhist site of ancient India. The position and remains of Tashkurghan were found to agree most closely with the description which Hiuen Tsiang and the earlier Chinese pilgrim, Sung-yun, give of the capital of the ancient Kie-pan-to. The identification of the latter territory with the modern Sarikol, first suggested by Sir Henry Yule, was thus fully established. The ruined town, which extends round the modern Chinese fort of Tashkurghan, and still shows a quadrangular enclosure of crumbling stone walls, "rests on a great rocky crag, and is backed by the river Sita" (*i.e.* the Yarkand river), on the east, exactly as the pilgrims describe it. As a striking instance of the tenacity of local tradition, it deserves to be mentioned that I found the curious legend which Hiuen Tsiang relates of the princess imprisoned in ancient days on a rock fastness still clinging to the identical locality of this valley.

I believe that Tashkurghan, as a historical site, has claim to even greater antiquity than that implied by the notices of Hiuen Tsiang and Sung-yun. Nature itself has plainly marked it not only as the administrative centre for the valleys of the Sarikol region, but also as the most convenient place for trade exchange on an ancient and once important route connecting great portions of Central Asia with the Far East and West. Judging from local observations, everything tends to support the view first expressed by Sir Henry Rawlinson that Tashkurghan, "the stone-tower," retains the position as well as the name of the *λίθινος πύργος*, which Ptolemy, and before him Marinus of Tyre, the geographer, knew as the emporium on the extreme western frontier of Serike, *i.e.* the Central Chinese dominions. From Tashkurghan the road lies equally open to Kashgar and Khotan, and thus to both the great trade routes which led in ancient times and during the middle ages from Turkestan into the interior of China. At Tashkurghan, also, the two best lines of communication across the Pamirs converge, the Taghdumbash valley, which gives access to the upper Oxus, being met here by the route which leads over the Naiza-Tash pass towards the "Great Pamir" and thence down to Shighnan.

In order to extend our survey over ground that was geographically interesting, I chose for our further march to Kashgar the route which passes through the high valleys between the Russian Pamirs and the western slopes of the great transverse range of Muztagh-Ata. On July 13 I had reached the shores of the "Little" Karakul lake, at the northern foot of the "Father of ice-mountains," and *circ.* 11,000 feet above sea-level, where I found a fairly large encampment of nomadic Kirghiz. The ample supply of sturdy Yaks which we obtained from them greatly facilitated transport arrangements. It thus became possible within the comparatively short time available to establish a series of excellent survey stations on various high spurs descending from Muztagh-Ata. They enabled us to extend the triangulation brought up from the Taghdumbash to the great glacier-crowned ranges facing Muztagh-Ata from the north and north-east and overlooking the Little Karakul lake (Fig. 2).

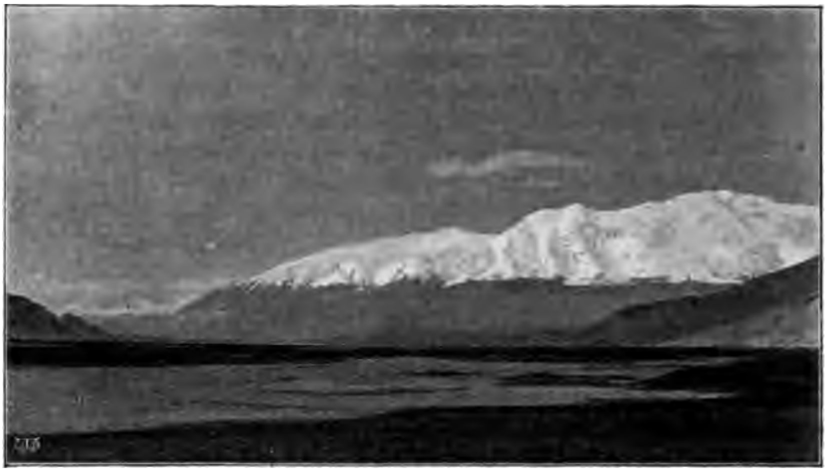

FIG. 2.—ICY RANGES NORTH OF MUZTAGH-ATA SEEN FROM LITTLE KARAKUL.

Their main peaks, though rising to over 23,000 feet, remain below the elevation of Muztagh-Ata. Yet these mighty walls of ice and snow, stretching their crest-line of dazzling whiteness for a distance of at least twenty-four miles, and streaked by numerous great glaciers, appeared perhaps even more awe-inspiring than the grand ice-girt dome of Muztagh-Ata itself (Fig. 3). Our stay in the midst of this mountain-world fell in what was probably the most favourable season; yet the hours when any considerable portion of the panorama was clear of clouds and driving rain or snow were few indeed. Notwithstanding the rapid changes of the atmospheric conditions and the difficulty of working a delicate instrument on heights ever exposed to cutting winds at temperatures that readily fell below freezing-point, the Bridges-Lee photo-theodolite proved very useful for recording topographical details. From the rounds of photo-theodolite views which were secured by me at a series of excellent survey stations, Lieut. Tillard, R.E., of the Trigonometrical Branch Office of the Survey of India, succeeded in constructing a map of the Muztagh-Ata region on the enlarged scale of 4 miles to the inch, which shows much additional detail. It will be published along with the general map embodying our survey. But both the taking of the photo-theodolite views and the working out of the results has absorbed a great amount of time and labour, and reference to the plane-table sections has, I believe, often been found indispensable in plotting.

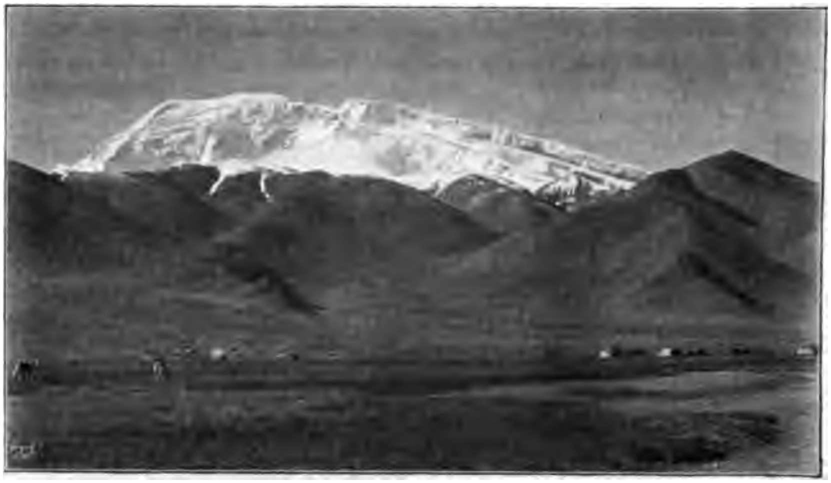

FIG. 3.—MUZTAGH-ATA, SEEN FROM LITTLE KARAKUL.

For the purpose of the photo-theodolite survey, and also in order to gain some closer personal experience of the "Father of ice-mountains," I made on July 18–19 two ascents on the western slopes of the central mass of Muztagh-Ata. The route chosen lay up the ridge which flanks the Yambulak glacier from the north, and, as seen from below, seemed to ascend unbroken to the northern of the twin peaks of the great mountain. It was by the same route that Dr. Sven Hedin, in the course of his explorations of 1894, had reached his highest point. But since the visit of the great Swedish traveller, the physical conditions on the surface of the ridge seem to have undergone a considerable change for the worse. At the time of his ascents the ridge appears to have been bare of snow up to an elevation estimated at over 20,000 feet, and consequently it had been possible to use yaks both for riding and transport. I found the ridge from *circ.* 15,500 feet upwards enveloped by heavy masses of snow, which seem likely to transform themselves gradually into a mantle of ice, such as lies over the other elevated slopes of the mountain. Only on the very edge of the precipitous rock-wall by which the ridge falls off towards the Yambulak glacier, small patches of rock protruded here and there from the deep snow. Above 17,000 feet even these disappeared, and at about the same height it was necessary to leave behind the yaks, which, foundering constantly in the deep snow, had become useless.

On the opposite side of the glacier the southern wall of rock is topped by a thick layer of ice to a far lower point, and consequently little avalanches would be seen gliding down from it as the day wore on. Luckily, on our side the glittering snow-sheet over which we ascended seemed to rest as yet firmly on the rock. The weather was by no means favourable, and on the second day we had to contend with frequent gusts of violent wind, and with occasional showers of snow. The maximum elevation I then reached was, by the evidence of the hypsometrical readings, within a few feet of 20,000 feet. It had taken nearly eight hours of constant toil to attain it from my camp, pitched at an elevation of over 15,000 feet. The couple of Kirghiz, who could be induced to set out with us, were, curiously enough, first seized by mountain-sickness, and had to be left behind with their yaks. At an elevation of about 19,000 feet, Ram Singh, the sub-surveyor, was obliged to stay behind, overcome by headache and lassitude. Next, Ajab Khan, the active Puniali, who had accompanied me as an orderly from Gilgit, fell out, and ultimately only the two splendid men of the "Hunza Levies," who had been selected for me by the Mir of Hunza, and had proved most useful as guides, plodded on with me.

The previous day, while engaged in phototheodolite work, I had sent them ahead to reconnoitre the ridge. Excellent climbers as they are, they had then reached a point apparently about 2000 feet higher up. Their progress was there stopped by a sheer precipice of impassable rocks descending to what I conclude to be a transverse glacier previously hidden from view, separating the great ridge we followed from the main mass of the northern summit, and communicating northwards with the Kampar-kishlak glacier. Owing to the threatening aspect of the weather, I had to forego the attempt, which our bodily condition would have otherwise well permitted, of reaching this furthest accessible point of the ridge. I was thus unable to judge with my own eyes of the true mountaineering difficulties that would have to be faced in the event of a systematic effort being made to climb the northern summit from this side. An ample allowance of time, a good Swiss guide or two, and a sufficient number of hardy Hunza mountaineers to carry loads, would seem to me indispensable provisions for such an effort.

As we descended, the clouds lifted towards the west, and revealed a panorama vast and impressive beyond description. It extended practically across the whole breadth of the Pamir region. Far away to the south-west it was bounded by glittering pinnacles, in which I could recognize the mountain-giants that guard the approach to the Indus valley. They had worthy rivals to the north in some towering masses of ice and snow, which I could not fail to identify with Mount Kaufmann and other great peaks of the Trans-Alai range.

The night, which I passed, uncomfortably enough, in my tent, pitched with difficulty at an elevation of about 16,500 feet, brought fresh snow with driving gales, and, after vainly waiting next day for a change, I was forced to descend once more towards Lake Karaku[illegible] Before leaving this inhospitable yet so fascinating neighbourhood, had the satisfaction to ascertain that the Kirghiz legend of a hoary saint (Pir) mysteriously residing on the inaccessible heights of the great ice-mountain, still retains distinct features of the "old story" which Hiuen Tsiang heard of the giant Buddhist hermit, who was seen entranced "on a great mountain covered with brooding vapours," evidently identical with Muztagh-Ata.

On July 23 I started down on to the plains of Kashgar by the route of the Gez defile. Owing to the collapse of one of the bridges in this remarkably narrow and difficult gorge, I was obliged to make a considerable *détour*, which entailed the crossing of the huge Koksel or Sarguluk glacier descending northwards from the great range we had surveyed before from the side of Lake Karakul. The lower portion of the defile was rendered altogether impassable by the summer floods of the glacier-fed Yamanyar river. So I had to take to the difficult track known as Tokuz-Dawan, "the Nine Passes," and barely passable for laden animals, which crosses a series of steep transverse spurs descending from the little-known eastern slopes of the great snowy range behind Muztagh-Ata. Leaving the sub-surveyor and heavy baggage to follow by easier stages, I pushed on by rapid marches, and after a finishing march of some fifty miles from Tashmalik, on July 29 arrived at Kashgar.

There, under the hospitable roof of Mr. G. Macartney, C.I.E., the political representative of the Indian Government, the kindest reception awaited me. After fully two months of fatiguing and almost incessant travel in the mountains I felt the need of some bodily rest before I could set out again for Khotan, the proper goal of my explorations. But my four weeks' stay in Kashgar was mainly accounted for by other and more pressing considerations. In view of the wide extent of the area that was to be covered by my travels within a period practically limited to one autumn and winter, the careful organization of my caravan was a matter of much importance. In this respect the experienced advice of Mr. Macartney and the practical assistance of his establishment were of great value to me. It was essential to limit the baggage with a view to rapidity of movement, and at the same time to ensure that all stores and equipment required during prolonged travels, and under widely varying conditions, should be kept ready available. I found that, including riding animals for myself and followers, eight camels and twelve ponies would be needed for my caravan. The trouble taken about their selection was amply repaid by the result; for, notwithstanding the fatigues entailed by our subsequent travels, which covered an aggregate of over 3000 miles, none of the animals I brought from Kashgar ever broke down. In the same way the number of followers was kept down to the indispensable minimum, the party including two camelmen, two pony-attendants (one of whom had to act also as Chinese interpreter), a cook, and a personal servant for myself. Apart from the sub-surveyor's Rajput cook, who had accompanied us from India, all the men came from Kashgar or Yarkand.

An important object of my stay at Kashgar was to familiarize the provincial Chinese Government with the purpose and character of my intended explorations. Mr. Macartney's efforts in this direction were entirely successful, owing mainly to the great personal influence and respect he enjoys among all Chinese dignitaries of the province. The result showed that from the Tao-tai, or provincial governor, downwards, all Chinese officials I came in contact with were ready and anxious to render me whatever help lay in their power. I look back to their invariable kindness and attention with all the more gratitude, as it was shown at a time when, as they knew well, the conflict with European powers was convulsing the empire in the East.

Such imperfect explanations and illustrations as, with an interpreter's help, I could give of the historical connection of ancient Indian culture and Buddhist religion with Central Asia, probably helped to dispel any doubts and suspicions which might otherwise have been roused by the intended excavations, etc. In this respect I found my references to the *Si-yu-ki*, the records of Hiuen Tsiang's travels, singularly helpful. All educated Chinese officials seem to have read or heard legendary accounts of the famous Chinese pilgrim's visit to the Buddhist kingdoms of the "Western countries." In my intercourse with them I never invoked in vain the memory of "the great monk of the Tang dynasty (*Tang-Sen*)," whose footsteps I was now endeavouring to trace in Turkestan, as I had done before in more than one part of India.

Busily engaged as I was during my stay at Kashgar with practical preparations, I managed also to survey a number of instructive ancient remains, chiefly ruins of Buddhist Stupas, in the vicinity, and to continue my studies of Turki. On September 11 I finally set out on the journey to Khotan. Choosing for the first portion of the march the track which crosses the region of moving sands around the popular shrine of Ordam-Padshah, I was able to fix the position of that curious pilgrimage place more accurately than is shown in existing maps. From Yarkand onwards I followed the ordinary caravan route, which leads along the southern edge of the great desert, and mostly through barren, uninhabited wastes of sand or gravel, towards Khotan. For me it had a special historical interest; a variety of antiquarian and topographical observations which I was able to make proved beyond doubt that we were moving along the identical great thoroughfare by which in earlier times the trade from the Oxus and the far West passed to Khotan and on to China.

It is impossible to refer here in detail to any of this evidence. But I may briefly mention at least the curious patches of ground frequently passed on the route beyond Guma, where the eroded loess is thickly strewn with fragments of coarse pottery, bricks, slag, and similar refuse, marking the sites of villages and hamlets long ago abandoned. Such *débris* areas, locally known as *Tatis*, are to be found in many places beyond the present limits of cultivation in the whole Khotan region; in some places they extend over square miles. They exhibit everywhere most striking evidence of the powerful erosive action of the winds and sand-storms which sweep over the desert and its outskirts for long periods of the spring and summer. The above-named fragments rest on nothing but natural loess, either hard or more or less disintegrated. Having alone survived by the hardness and weight of their material, these fragments sink lower and lower as the erosion of the ground beneath proceeds, while everything in the shape of mud-walls, sun-burnt bricks, timber, etc., as used in the construction of Turkestan houses, has long ago decayed or been swept away.

On October 12 I reached Khotan town, the present capital of the territory which was to form the special field for my archæological explorations. I had entered the oasis on the preceding day with some feeling of emotion; for even before the discoveries that rewarded my labours, there was much to suggest the important part played by this little kingdom in that most fascinating chapter of ancient history which witnessed the interchange of the cultures of India, China, and the classical West. I lost no time before commencing the local inquiries which were to guide me as to the sites particularly deserving exploration. Apprehensions about possible forgeries, which experience proved to have been fully justified, had prevented me from sending in advance information as to the object of my journey. I now found that some time would have to be allowed for the collection of specimens of antiquities from the various old sites which Khotan "treasure-seekers" were in the habit of visiting. I was glad to utilize the interval for a geographical task which I knew to possess special interest.

That portion of the Kuen-luen range which contains the headwaters of the Yurung-kash or Khotan river, had never been properly surveyed, the only available information being contained in the sketch-map of the route by which Mr. Johnson, in 1865, had made his way from Ladak down to Khotan. Colonel Trotter had already, in 1875, expressed the belief that the headwaters of the Yurung-kash were much further to the east than shown in that map, and probably identical with a stream rising on the high plateau south of Polu. Captain Deasy, working from the side of Polu in 1898, succeeded in reaching the sources of this stream at an elevation of close on 16,000 feet, but was prevented from following it downwards. Thus the true course of the main feeder of the Yurung-kash, together with most of the orography of the surrounding region, still remained to be explored.

On the 17th October I started with the lightest possible equipment for the mountains. Pan-Darin, the Amban of Khotan, had, during the few days of my halt, done all that was needed to facilitate my arrangements for transport and supplies, and to assure me local assistance. Subsequent experience showed that I had found in this amiable and learned Mandarin a true and reliable friend, thoroughly interested in my work, and ever ready to help me with all that was in his power. I feel convinced that without his active co-operation, and subsequently that of his Keriya colleague, neither the tour through the mountains nor the explorations in the desert could have been accomplished.

The valley of the Yurung-kash becomes impassable within one march of its debouchure. There, near the small villages of Jamada and Kumat, the precious jade is dug, from which the river takes its name ("white jade"). Hence the route to Karanghu-tagh, the southernmost inhabited place, leads over a series of more or less parallel ranges that separate side valleys draining from the east. These outer ranges, rising in a succession of plateaus fissured by deep winding ravines, exhibit in a most striking form the results of that extreme disintegration which is the characteristic feature of the whole mountain system. Nothing but loose earth, gravel, or conglomerate in the last stage of decomposition is to be seen on the surface of the hillsides; while their high elevation and the dryness of the climate prevent the growth of any but the scantiest vegetation in rare patches of low, tough grass. The effects of the dust-haze which rises so constantly over the desert plains were still sufficiently marked to prevent any distant view being obtained from the Ulugh Dawan, by which we crossed the Tikelik range at an elevation of about 12,000 feet. But from the next range, between the valleys of Buya and Pisha, a very extensive panorama opened out before us.

In a grand mountain-mass raising its glacier-crowned head in solitary splendour to the south-east, it was impossible to mistake the "Kuen-luen peak, No. 5," already triangulated from the Ladak side (Fig. 4). Behind this great mountain, for which the tables supplied by the Survey Department indicated a height of 23,890 feet, to the south and south-east, there was to be seen a magnificent line of high snowy peaks marking the watershed towards the westernmost portion of the Aksai-chin plateau of Tibet. It soon became clear that the Yurung-kash has cut its way between the main range and the great mass of "K5," or Muztagh ("the ice mountain," *κατ' ἐξοχὴν*, as it is called by the few Taghliks of these valleys). Its course is indicated by a gap between the stupendous spurs which descend from Muztagh, and from the almost equally high peaks on the watershed range, and could, in the remarkably clear atmosphere that favoured us, be made out for a considerable distance to the south-east. It was found to run exactly in the direction where Captain Deasy had traced the real source of the river. In other respects, too, the orographical features actually before us differed strikingly from those which the above mentioned sketch-map had led me to expect.

The next outer range, which was crossed at an elevation of close on 14,000 feet, offered a still better view of this magnificent panorama.

But vainly I searched the crest-line for other peaks which could be identified with points already triangulated from the Ladak side, and which would thus secure to us the eagerly sought connection with the Indian Trigonometrical system. The descent which followed, of some 6000 feet, to the deep rock-bound gorge of the Yurung-kash, was by its steepness and ruggedness an experience long to be remembered, especially as night overtook us. The track was almost impracticable for our baggage ponies. Fortunately it was possible to replace them by yaks at Karanghu-tagh, a small settlement of herdsmen which, owing to its inaccessibility, is also used as a penal station for select malefactors from Khotan. "Karanghu-tagh" literally means "mountain of blinding darkness,"—a fitting enough name for this terribly bleak place of banishment. The Kash river on which it lies is fed by a series of great glaciers on the main range to the south, and joins the Yurung-kash a few miles below the hamlet.

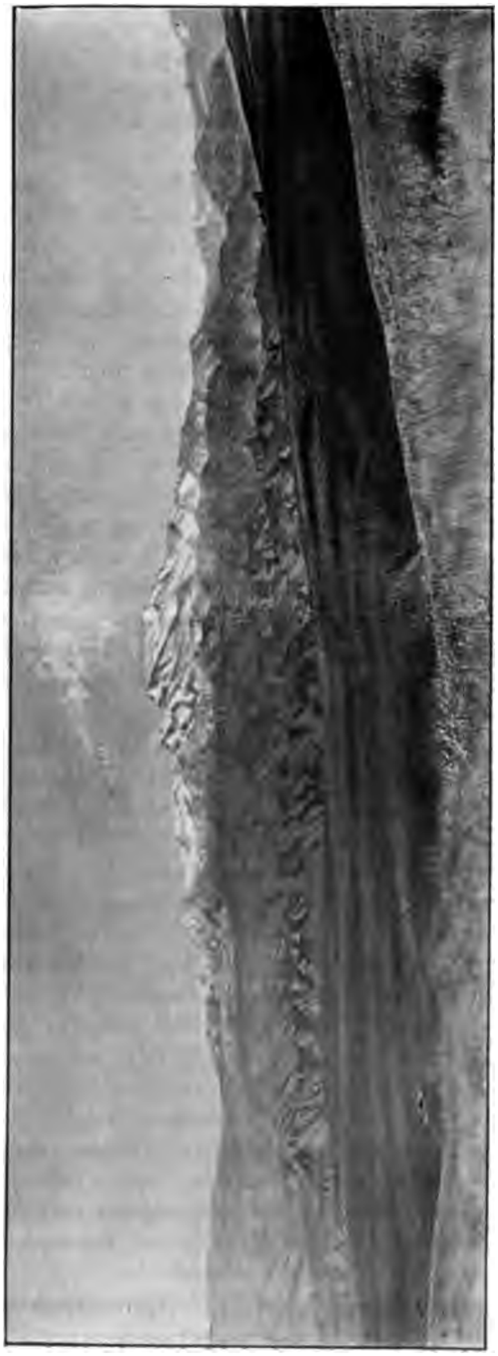

FIG. 4.—PEAK "KUEN-LUEN NO. 5" (OR "MUZTAGH"), SEEN FROM NORTH-WEST, WITH RANGES ABOVE YURUNGKASH GORGE ON RIGHT.

Leaving the ponies

and whatever of baggage could be spared at Karanghu-tagh, I endeavoured to follow up the gorge of the Yurung-kash as far as possible towards the head of the river. The hillmen knew of no track beyond a point known as "Issik-bulak," from its hot spring. There the river, unfordable even late in the autumn, fills completely the narrow passage it has cut round the mighty southern buttresses of "Kuen-luen No. 5," and progress becomes impossible, even for yaks. Accompanied by Ram Singh and a couple of Taghliks, I penetrated, on October 27, a few miles further into the gorge, climbing with difficulty along the precipitous cliffs which face the frowning ridges on the south. But no track could be discovered practicable for load-carrying men, and ultimately I had to turn back. It was impossible for me to wait for the chance of the river getting completely frozen. Even then I doubt whether a practicable passage could be secured, considering the rigours of the winter and the masses of fallen rock likely to be encountered. It is from the high but comparatively open ground near the sources far away to the south-east that the uppermost portion of the river course will have finally to be explored.

From Karanghu-tagh we proceeded to the north-west by a difficult route, which forms the only connection of the valley with the outer world besides that we had come by. It required a good deal of negotiation and "demi-official" pressure before the surly hillmen of Karanghu-tagh would supply guides and yaks for it. The inhospitable mountain tract into which it took us had so far remained wholly unexplored.

Over a succession of high transverse ranges we crossed into the valleys of Nissa and Chash. By camping close to the passes we managed to climb to some excellent survey-stations, particularly on the Brinjak ridge, some 15,300 feet above the sea. The views I obtained there will show, better than any description could, the weird grandeur of this mountain scenery (Fig. 5). Below a glacier-clad crest-line, of an approximate height of 20,000 feet, there rise in all directions fantastically-serrated ridges, with deep gorges between them, like the waves of an angry sea. Exceptionally clear weather favoured us; but the increasing cold and the exposure inevitable on such elevated ground made survey-work, especially with the photo-theodolite, very trying.

Beyond the Yagan-Dawan pass, by which I crossed into the drainage area of the Kara-kash ("black jade") river, I had ample opportunity to observe the extraordinary results produced by erosion on mountain formations subject to excessive disintegration (Fig. 6). It appeared to me that only the erosive action of water could have produced that perfect maze of deep-cut arid gorges through which we had to wind our way. Yet in this very region the fall of rain and snow is now very scanty, and the consequent absence of water is a serious obstacle for the traveller. Luckily, we could overcome it by the transport of ice.

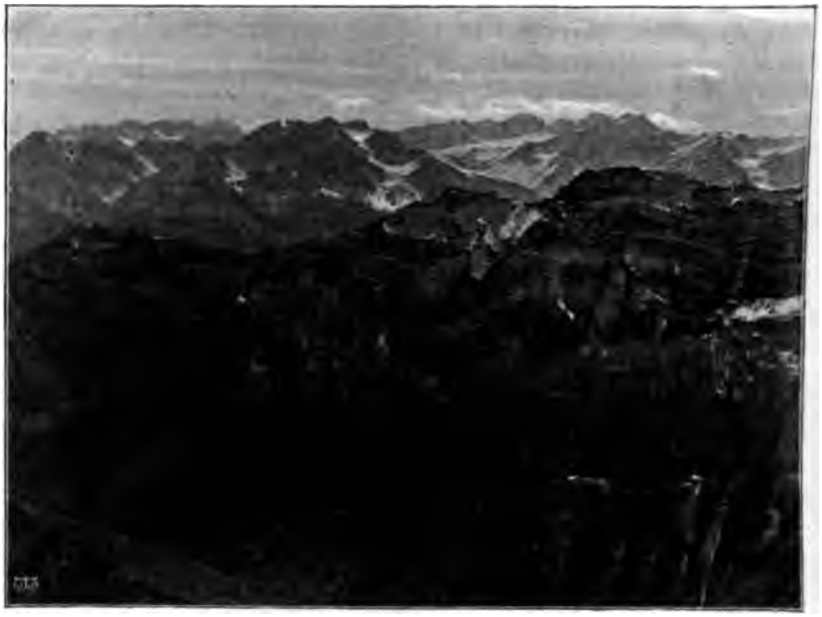

FIG. 5.—GLACIERS AT HEAD OF KASH RIVER, SEEN FROM BRINJAK RIDGE.

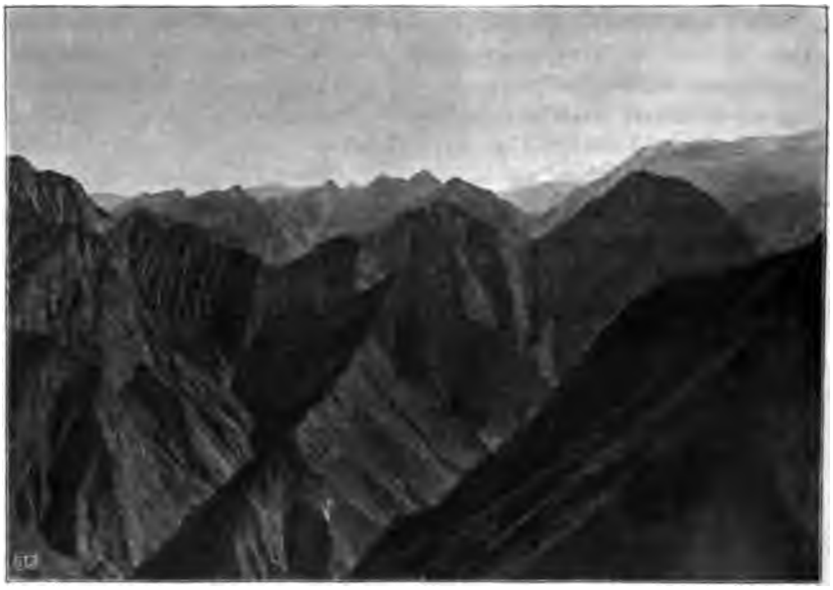

FIG. 6.—ERODED RANGES TO SOUTH-EAST OF YAGAN-DAWAN.

I had almost despaired of connecting our survey work with the Indian triangulation, when unexpectedly the last range we had to cross towards the plains revealed a view more extensive than any before. Among the many high snowy peaks visible southwards, and also beyond the upper Karakash river, two more triangulated points, besides "Kuen-luen No. 5," could be identified with certainty. It thus became possible to determine our position on the Ulughat-Dawan, close on 10,000 feet above the sea, by theodolite and to measure angles to all prominent heights of the ranges within view. To the north there extended, boundless like the sea, the vast plain of the desert. The light dust-haze covering it looked beautiful as it reflected the brilliant moonlight of that first night I spent on the pass waiting for the arrival of water. The dinner for which it was needed, did not get ready till 2 a.m. I knew that a wind raising the haze would effectively stop further survey work. So I hurried to reach another high ridge further east, with an equally extensive view, that would allow us to complete the triangulation. It was successfully climbed after a great *détour* that cost us two days, and just in time. As the work was approaching completion, a strong wind sweeping over the desert carried up a thick dust-haze, and for weeks effaced all distant views. Some prominent peaks in the outer range of hills, which are visible from Khotan town when the atmosphere is clear, have been fixed by our work. With the help of these points it will be possible to connect Khotan with the Indian trigonometrical system, and finally to verify its longitude. But such occasions of dust-clear weather are rare, and of the only one which occurred during my subsequent short stay in Khotan, in April, full advantage could not be taken by myself. Thus this task is still left to a future traveller, who will be able to afford time for patiently awaiting his opportunity at Khotan.

By the middle of November I had returned to Khotan, where, after our rough and rapid marches through the mountains, I was glad to allow my men and animals a well-earned short rest before starting once more for the winter's work in the desert. I myself was busy at work with the examination of the antiquities which the prospecting parties, sent out a month earlier, had brought back from various sites in the desert. I also made a series of excursions for the purpose of a close survey of the old localities within the Khotan oasis itself. This enabled me satisfactorily to settle numerous questions bearing on its ancient topography, and in particular to locate almost all the sacred Buddhist shrines which are described to us by the early Chinese pilgrims. Their positions were invariably found to be occupied now by Muhammadan Ziarats, or Saints' tombs, which form the object of popular pilgrimage. Local worship can thus be shown to have outlived the great change in religion consequent on the Muhammadan conquest. Its tenacity has indeed proved quite as useful for the study of the ancient topography of Khotan as it had proved to me before in Kashmir and other parts of India.

I must restrict myself here to a few remarks only concerning the most interesting of those old localities—the site of the ancient capital. Its *débris*-layers, which have furnished by far the greatest portion of the Khotan antiquities, such as terra-cottas, seals, coins, etc., acquired by former travellers, lie buried deep below the fields of the little village of Yotkan, some seven miles to the west of the present town. Gold-washing operations, originating in an accidental discovery of gold some thirty-seven years ago, have gradually led there to the excavation of an area over half a mile square. The careful examination of the banks thus laid bare showed me that the "culture-strata," as I should call them, of Yotkan are composed of the rubbish that gradually accumulated during the centuries while the site continued to be occupied by houses, from about the commencement of our era until after the advent of Islam (in the eleventh century of our era). These "culture-strata," themselves 5 to 14 feet thick at various points, are covered by a layer of pure soil from 9 to 20 feet in thickness. This layer, which shows no sign of stratification, is manifestly due to silt-deposit, the necessary result of intensive and long-continued irrigation such as prevails all over the oasis. Owing to the disintegrated condition of the soil, all the water that is brought down from the mountains by the Yurung-kash and Kara-kash rivers, and subsequently distributed by innumerable irrigation channels, carries an excessive quantity of sediment. The silt thus deposited over all cultivated areas is amply sufficient to account for the gradual burying of the rubbish layers of the ancient capital and for other curious observations I have made as to the gradual raising of the ground level throughout the oasis. All antiquarian and physical evidence combines to oppose the assumption of a great flood or similar catastrophe, such as some earlier European visitors of the site have suggested.

Among the ancient sites in the Taklamakan desert which are frequented by Khotan "treasure-seekers," and which the prospecting parties sent out by me had visited, none seemed to offer better opportunities for systematic excavations than the one known to them as Dandan-Uilik. Turdi, an old and, as experience showed, reliable member of that fraternity, had brought me from there some interesting relics, including fragments of Buddhist sculptures, an inscribed piece of fresco, and a small but undoubtedly genuine scrap of paper with ancient Indian Brahmi characters. Further inquiries made it certain that Dandan-Uilik was identical with the ruined site which Dr. Sven Hedin had seen on his march to the Keriya Darya, and which in the narrative of his travels is spoken of as "the ancient city Taklamakan."

After hurriedly completing in Khotan the preparations for our winter campaign, I started on December 7 for Tawakkel, a small oasis on the outskirts of the forest-belt which accompanies the Yurung-kash on its course through the desert. Thanks to the stringent orders issued by Pan-Darin, the kindly Amban of Khotan, I speedily secured there the thirty labourers I wished to take with me for purposes of excavation, as well as a four-weeks' food-supply. Owing to the reluctance of the village cultivators to venture far into the desert, it would otherwise have been difficult to obtain sufficient labour, especially in view of the rigours of the winter. The ponies, for which the desert offered neither sufficient water nor food, were sent back to Khotan while we set out on foot, the heavily laden camels carrying the food-supplies, together with the indispensable baggage. Marching in the drift-sand was slow work, though the dunes amidst which we passed as soon as we had left the east bank of the river nowhere rose above 15 feet. Within five days Turdi had safely guided us through the sandy waste to the area where the trunks of dead poplars, rising shrivelled and gaunt from between low dunes, indicated the vicinity of ancient cultivation. On the following day (December 18) I had my camp pitched in the middle of the ruins I was in search of.

I soon found that the structural remains of the site consisted of isolated groups of small houses scattered over an area about 1½ miles from north to south and three-quarters of a mile broad. The walls, constructed throughout of a wooden framework covered with plaster, were either broken down within a few feet from the ground if exposed, or, where covered by low dunes, could be made out by the wooden posts of the framework sticking out from the sand. The structures left more or less exposed had already been searched by native "treasure-seekers." Their operations repeated in successive seasons had, together with the erosive action of the wind, caused great destruction among these ruins. But the scanty remains left on some walls of frescoes representing Buddhas, or Bodhisattvas, showed at once plainly that the ruins belonged to the Buddhist period, and that some of them must have served as Buddhist places of worship.

Luckily the native "treasure-seekers" are prevented by the difficulty of carrying sufficient supplies from stopping longer than a few days. Hence they had never been able to attack the ruins more deeply covered by the sand. Thus when I commenced with my little force of labourers the systematic excavation of structures half buried by low dunes, most interesting archæological results soon began to reward me. From the Cellas of little Buddhist shrines there came to light in large numbers stucco images and relievos, frescoes and painted wooden tablets, all showing representations of saints and legends of sacred Buddhist lore (Fig. 7). In style and technical treatment they exhibit a close resemblance to that period of ancient Indian art which is best known to us from the latter Ajanta cave paintings. Wherever protected by the dry desert sand, the colours have survived in remarkable freshness. Here, then, were rising from their tomb long-lost relics of that Indian art which had found a second home in Buddhist Central Asia before spreading further into the Far East.

Great was my joy when, on excavating what must have been the ground-floor room of a small monastic dwelling-place, the men came upon the first leaves of paper manuscripts. Carefully extracted with my own hands and cleared, they proved to contain portions of a Buddhist canonical text in Sanskrit. Judging from the palæographic character of the writing, these and subsequent finds of fragmentary Sanskrit manuscripts from Dandan-Uilik ruins may approximately be assigned to the sixth or seventh century of our era. In addition to such texts in the classical language of India, the literary discoveries of this site include a considerable number of manuscript folia and of detached documents on paper, written in Indian Brahmi characters, but in a non-Indian language. Taking into account that the same strange language appears in inscriptions affixed to some frescoes, it seems probable that we have here records of the indigenous tongue actually spoken by the Khotan people of that period. Only the close study of all these documents—a task which may take years—is likely to lead to a decipherment, and thus to a solution of this interesting question.

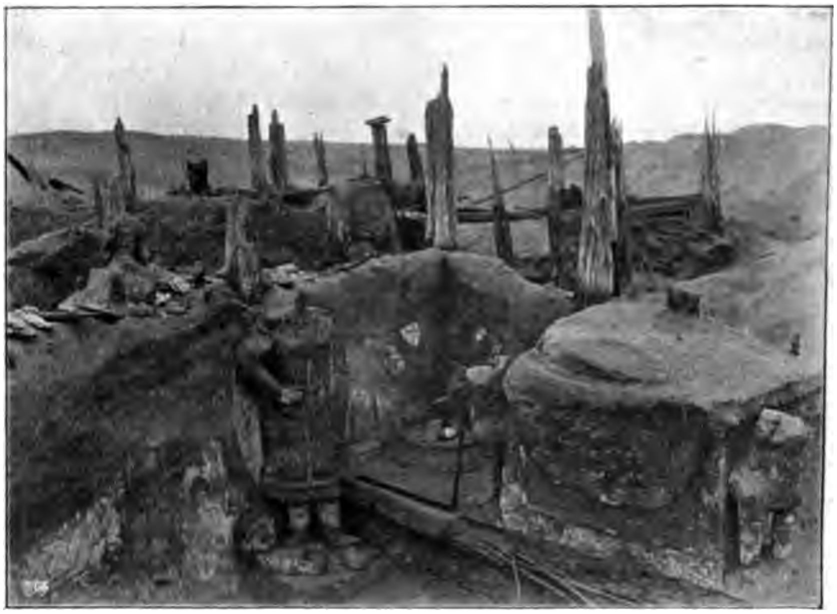

FIG. 7.—STUCCO SCULPTURES AND FRESCOES IN BUDDHIST TEMPLE CELLA EXCAVATED AT DANDAN-UILIK.

In the mean time, it is fortunate indeed that the discovery of

Chinese paper documents in other small monastic dwellings permits us to determine with accuracy the period when the settlement represented by the settlement of Dandan-Uilik was finally abandoned. Among the neatly folded small paper rolls containing letters, records of loans, petitions, and similar matter, there are three at least which already, on preliminary examination at Kashgar, proved to be dated with precision, the Chinese years indicated corresponding to the years 778, 782, 787 of our era. There are good reasons for assuming that these petty records do not precede by any great length of time the date when the dwellings were abandoned. We thus obtain the end of the eighth century as the approximate chronological limit for the existence of Dandan-Uilik as an inhabited locality. This dating is entirely supported by the evidence of the numerous old Chinese coins I found at the site, the latest bearing the symbols of the dynastic period, which corresponds to the years 713–741 A.D.

The three weeks I spent in continuous excavations, from the early morning until daylight failed us, enabled me to explore all ruins traceable under the sand. It was a happy time for me personally, though the physical conditions were trying. The severe winter of the desert had already set in when I started from Khotan. During my stay at Dandan-Uilik, the temperature at night usually went down to a minimum of about 10° Fahr. below zero. In the daytime it never rose above freezing-point in the shade. The weather was cloudy, but luckily there was very little wind. Its absence is an essential condition for all prolonged work in the desert. The dead trees of the little orchards which once surrounded most of the scattered groups of shrines and dwellings supplied fuel in plenty. Yet the men suffered from the exposure as well as from the badness of the water, the only available supply coming from a brackish well they had succeeded in digging in a depression of the ground over a mile from the main ruins. My own little tent brought from India, though provided with an extra serge lining, was a bitterly cold abode at night. When the temperature had once gone to about 6° below freezing-point, writing or reading became impossible, and I had to take to my bed, however anxious I might have been to study the manuscript finds of the day, etc. But, from long experience, life in a tent seems the one most congenial to me, and, with such fascinating work to occupy me, the four and a half months spent in the desolation of the desert were indeed an enjoyable time.

During my stay at Dandan-Uilik, Ram Singh had again joined me from the direction of the Keriya river. I had despatched him a month earlier on an independent survey of the high range which extends between "Kuen-luen No. 5" and the mountains eastwards where connection could be obtained with Captain Deasy's work about Polu. On comparing my own plane-table fixing for Dandan-Uilik with his, a gratifying surprise awaited me. Notwithstanding that we had brought our survey from entirely different directions and over great distances of such deceptive ground as sandy plains and dunes, I found that Ram Singh's position differed from my own by only about a mile in latitude and half a mile in longitude.

My detailed survey of the Dandan-Uilik site, together with other observations of a semi-topographical, semi-antiquarian nature which gradually accumulated during my explorations at this and other sites, make it very probable that the lands of Dandan-Uilik were irrigated from an extension of the canals which had, down to an even later date, brought the water of the streams of Chira and Gulakhma to the desert area due south of the ruins. I must reserve for another occasion a discussion of the archæological evidence as to the causes which led to the abandonment of this advanced settlement. There is every reason to believe that this abandonment was a gradual one, and in no way connected with any sudden physical catastrophe. The Sodom and Gomorrha legends heard all over Turkestan about "old towns" suddenly submerged under the sand-dunes, are more ancient than the ruins of Dandan-Uilik themselves, and interesting as folk-lore. But where we have plain historical and antiquarian evidence to the contrary, scientific inquiry can have no concern with them.

On January 6 I dismissed my Tawakkel labourers who had worked so valiantly, and after a three days' march over truly forbidding ground, struck the Keriya Darya. The successive ridges of sand, rising to heights of about 200 feet, were the most formidable I ever crossed. A four-days' march along the hard-frozen river brought us to the oasis and town of Keriya, where Khon-Daloi, the Amban, accorded me the heartiest welcome. There I first heard of the existence of "an old town"—*kone shahr*, as all ruins are popularly called in Turkestan—in the desert north of the well-known pilgrimage place of Imam-Jafar-Sadik. The information was very scanty, and the distance great. But certain indications pointed to a site of special interest; so I decided to set out for it after a few days' halt needed to rest my followers.

At Niya, which is the easternmost permanently inhabited place of the district, just as in the days of Hiuen Tsiang, who notices it under the name of Ni-jang, I received most encouraging proof that I was on the way to a site far older and hence more important than any I had examined so far. Owing to its great distance, the Khotan "treasure-seekers" knew, luckily, nothing of it. An adventurous young villager from Niya was the only man who in recent years had visited the ruins. From one of the ruined houses he had picked up two small wooden tablets. When they were brought to me I noticed at once that the writing they contained was in the ancient Indian script known as Kharoshthi, and of a type that chronologically belongs to the first and second centuries of our era. I hid my delight as well as I could, and pushed on still more rapidly, after securing a sufficient number of labourers and the needful supplies for prolonged excavations. After a three days' march through the belt of thick jungle which lines the winding course of the Niya river through the desert, the curious shrine of Imam Jafar Sadik was reached. There the river finally loses itself in the sands, and as water cannot be obtained by digging, we had to depend for our further progress on what could be carried along from that locality. Fortunately the intense cold still prevailing through this and the following month (on January 26 I registered a minimum of 12° Fahr. below zero) permitted its convenient and regular transport in the form of ice.

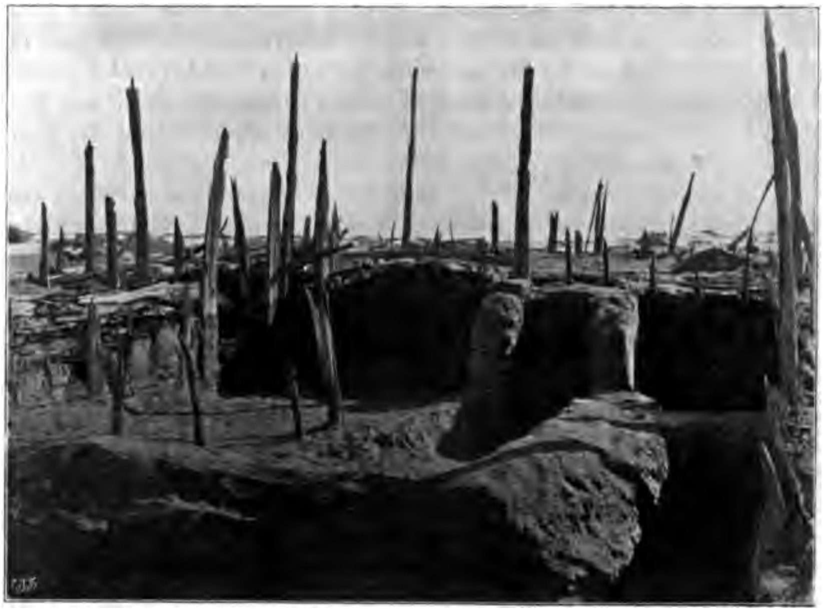

FIG. 8.—ROOM OF ANCIENT DWELLING (FIRST FIND-PLACE OF INSCRIBED TABLETS), NIYA RIVER SITE, AFTER EXCAVATION.

After a march of about 30 miles through the desert northward, I arrived on the evening of January 27 at the southern edge of the wide area over which are scattered the ruins I was in search of. The subsequent explorations showed that it extends for over 11 miles from north to south, with a maximum breadth of about 4½ miles.

Pitching my camp near a small Stupa half buried in the sand, I proceeded next morning to the ruined house where Ibrahim, the young Niya villager already mentioned, had unearthed his inscribed tablets. He declared he had left more *in situ*. It was a moment of cheerful excitement when I approached the timber *débris*, rising like the remains of a wreck from the eroded ground around it. On the sandy slope I found at once some-tablets actually exposed, and many more scattered about under a slight layer of drift-sand within the small room where Ibrahim had originally unearthed them (Fig. 8). The house which contained it had, like the rest of the buildings at this site, been constructed of a wooden framework of massive beams and posts. Between the latter rose the walls of hard plaster, strengthened internally by thick mattings of rushes. These walls had completely decayed where not actually covered by sand, but the posts, now blanched and splintered, still rise high above the surface. In the building first explored, the sand, which during former centuries must have protected it, had largely drifted away. The remarkable state of preservation in which many of the inscribed tablets were found, was hence all the more surprising. Over a hundred were cleared from the little room already mentioned, and the excavation of a large room of the same building, on the day following, more than doubled that number. Unfortunately the protecting layer of sand was here only about two feet deep, and in consequence all materials not lying quite flat on the floor had decayed completely.

The present condition of this ruin, which originally appears to have been used as a monastic building, illustrates strikingly the destructive effect of erosion on this and other structures of the site. The actual remains of the building occupy a small plateau raised now 12 to 15 feet above the immediately surrounding ground. The lower level of the latter is the unmistakable result of erosion. While the strip of ground actually protected by the *débris* of this and similar structures retains the original level, the open surface near by, consisting of mere loess, has been gradually lowered by the action of the wind. The drift-sand carried along this portion of the desert is not sufficient at present to fill the depression thus created. From the geological point of view, not less than from the archæological, it would be interesting to study the exact conditions under which the power of the desert winds asserts itself in its two main lines of action—erosion and the movement of drift-sand. But I am convinced that it will take years of minute and systematic observation before any safe conclusions can be arrived at as to the rate at which the work of these forces proceeds in various parts of the Taklamakan. And even then there will be little to guide us as to the corresponding conditions prevailing during earlier historical periods.

While most of the buildings of this important site had suffered from erosion, there were others where parts at least were still buried under deep sand (Fig. 9). From some of these my excavations brought to light many very interesting objects illustrating the industrial arts of the period. The articles of ornamental wood-carving, which include elaborately worked chairs, small architraves and other architectural pieces, etc., show decorative motives familiar to us from the *relievo* sculptures of the ruined Buddhist monasteries on the North-West Frontier of India, the ancient Gandhara. The date thus indicated fully agrees with the chronological evidence of the Kharoshthi writing on the wooden tablets, apparently memoranda and lists, found scattered in various rooms of the same dwellings. Broken pieces of arms, household implements, a musical instrument and similar objects of domestic use, all of wood, help vividly to bring before our eyes the conditions of everyday life of this distant region in the first centuries of our era.

It was difficult for me to realize fully that so many centuries had passed since these dwellings were deserted while I traced the plan and arrangement of the orchards and gardens once surrounding them. Rows of fallen poplars, some 50 feet in length, half-covered by the sand, showed the position of avenues, such as are planted to this day everywhere along the roads and canals of Turkestan oases. The rush-fences used then, as now, for the enclosures of gardens could be seen sticking out from the sand. A little digging along them often revealed small heaps of dry leaves that must have accumulated there while the trees, now reduced to blanched and withered trunks, were still thriving. Among these my diggers had no difficulty in distinguishing various fruit trees, such as the peach, plum, apricot, mulberry, etc., with the wood of which they are familiar from their own homes.

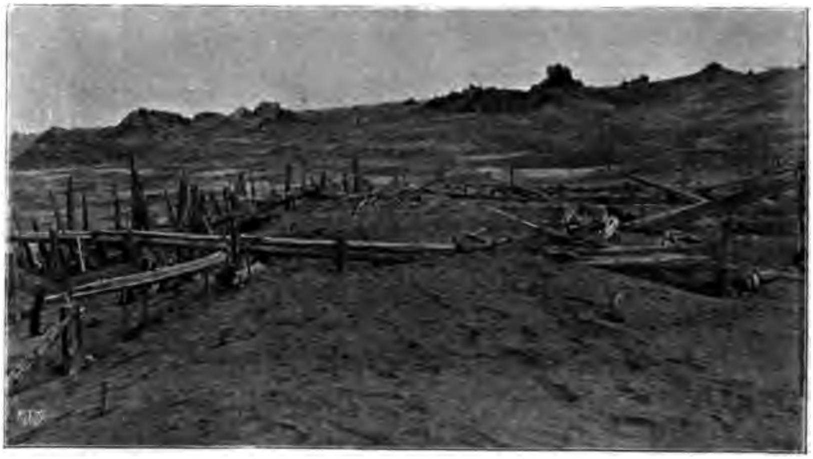

FIG. 9.—SAND-BURIED ANCIENT HOUSE, NIYA RIVER SITE, BEFORE EXCAVATION.

The character and conditions of the articles found within the houses plainly showed that they had been cleared by their last inhabitants, or soon after their departure, of everything that possessed value. Luckily, there were left behind the rubbish heaps to reward me with finds of the greatest antiquarian interest. The richest mine of this sort was struck in a small and much-decayed building, one room of which proved to contain a consolidated mass of refuse, lying fully

4 feet above the original floor. Among the layers of broken pottery, rags of felt and of woven fabrics, pieces of leather and other rubbish, I discovered there over two hundred documents on wood, of all shapes and sizes. Besides tablets with the Indian Kharoshthi writing, which form the great majority, there came to light numerous narrow pieces of wood bearing Chinese characters, and two dozen Kharoshthi documents on leather, a material one could hardly expect to find among a Buddhist population with an Indian civilization.

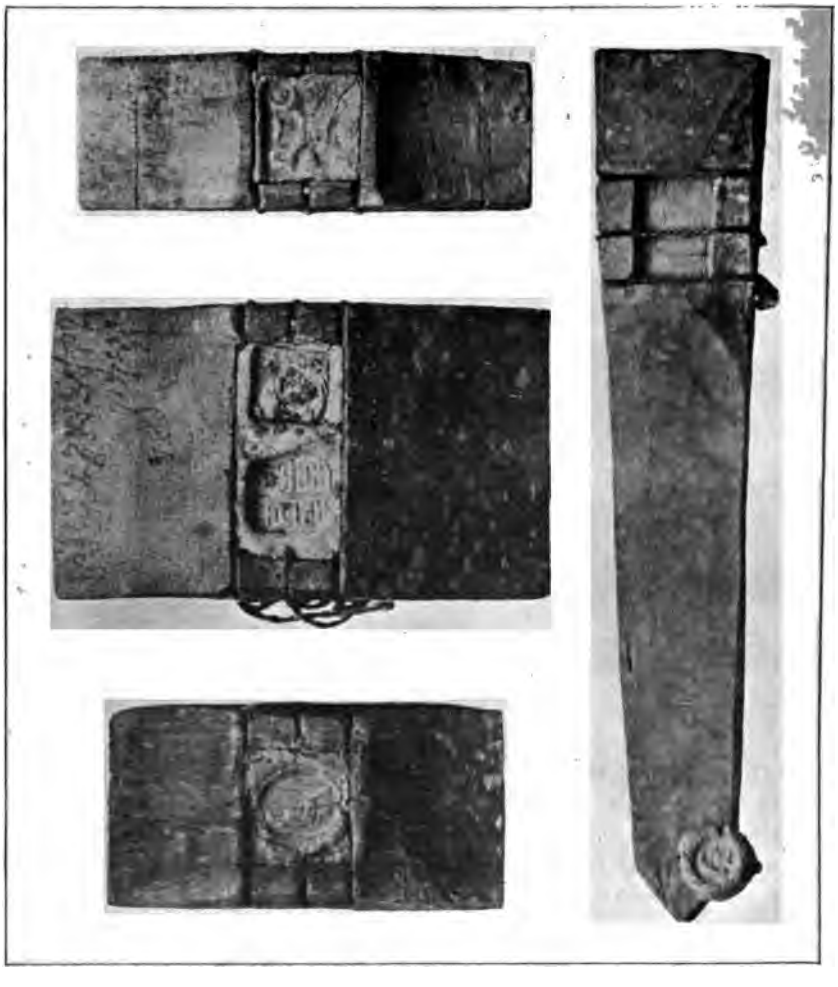

FIG. 10.—COVERING TABLETS OF ANCIENT KHAROSHTHI DOCUMENTS ON WOOD, WITH CLAY SEALS (½).

Many of the Kharoshthi tablets unearthed are in excellent preservation, and still retain the original clay seals and strings with which they were fastened (Fig. 10). We are thus able to study exactly the technicalities connected with the use of wood as a writing material. This is not the place to discuss such details, but I may mention at least that each document intended as a letter or record of some importance, whether wedge-shaped or oblong, is provided with a carefully fitted covering piece or envelope bearing the address or "docket" entry. An ingeniously designed system of fastening with a string and a neatly inserted clay seal, prevented unauthorized inspection of the contents.

The remarkable series of clay seals discovered on these tablets is of exceptional interest, because it furnishes most convincing evidence of the influence which classical Western art has exercised even in distant Khotan. A frequently recurring seal, probably that of an official, shows the figure of Pallas Athene, with shield and ægis, treated in archaic fashion. Another fine seal is that of a well-modelled naked figure of pure classical outline, perhaps a seated Eros. On others, again, appear portrait-heads showing classical modelling, though barbarian features, etc. We know well how classical art had established its influence in Bactria, and on the North-West Frontier of India. But there was little to prepare us for such tangible proofs of the fact that it had penetrated so much further to the east, to halfway between Western Europe and Peking. I may note here, as an interesting discovery made while these pages are passing through the press, that Professor Karabacek has traced the remains of a Greek legend, apparently a magic formula, impressed on the edge of one of the clay seals, containing in its centre the figure of Athene Promachos.

From the contents of the documents themselves we may confidently expect much fresh light upon a chapter of Central Asian history and civilization which until now has seemed almost entirely lost. Owing to the great number of the texts, the cursive character of the script, and peculiar difficulties connected with the nature of the records, their complete decipherment will require much time and labour. But it is already certain that, as I recognized in the course of my first examination on the spot, the language of the documents is an early form of Indian Prakrit, with a large admixture of Sanskrit terms. It is highly probable that most of them contain official orders, such as safe conducts, correspondence, etc., as well as private memoranda and records. Religious texts, prayers, etc., may be suspected in some of the long tablets, found in what seem to be shrines or monasteries. Many of the documents bear exact dates, in which the years are indicated with reference to the reigns of named rulers. These will enable us probably to restore a portion of the historical chronology of this region.

But whatever revelations of interesting detail may be in store for us, one important historical fact stands out clearly already. The use of an Indian language in the vast majority of these documents, when considered together with the secular character of most of them, strikingly confirms the old local tradition recorded by Hiuen Tsiang, that the territory of Khotan was conquered and colonized about two centuries before our era by Indian immigrants from the North-Western Punjab. It is a significant fact that the Kharoshthi script used in our tablets was peculiar to the very region of ancient Taxila which the above tradition names as the original home of those immigrants. It is strange indeed that the ruined dwellings of a settlement far away in the barbarian North, overrun by what Hindu mythology knew as the "great sand ocean," should have revealed to us, after nearly two thousand years, the oldest written documents (as distinguished from inscriptions), and of a type of which ancient specimens have never come to light as yet in India proper. It is equally strange, and yet easily explained by the historical connection of Khotan with China, that we should find buried along with them what are likely to prove the oldest written Chinese records, actually extant.

There is ample evidence to show that this remarkable site must have been deserted already within the first few centuries of our era. Apart from the Kharoshthi writing of the tablets and leather documents, which agrees closely in its palæographic features with the Kharoshthi inscriptions of the Kushana kings of the first and second centuries, there is the eloquent testimony of the coins. The very numerous finds, extending over the whole area, which were made during my stay, include only copper pieces of the Chinese Han dynasty, whose reign came to a close in A.D. 220. The use of wood as the only writing material, apart from leather, is also a proof of great antiquity. The use of paper for writing purposes is attested in Chinese Turkestan from at least the fourth century A.D. onwards; yet among all the ruined houses and ancient rubbish-heaps not the smallest scrap of paper was discovered.

After three weeks of almost incessant excavation work, I left this fascinating site which had yielded such rich antiquarian spoil, in order to visit, further to the east, ruins I had heard of at Niya. A march of about 100 miles through the desert, due east of Imam Jafar, brought us to where the Endere stream is lost in the sands. After a day's march further to the south-east I found a ruined Stupa, and at some distance from it a small circular fort filled with sand-buried buildings.

My excavations at what proved to be a Buddhist temple, situated in the very centre, brought to light some interesting stucco sculptures, and besides, a considerable quantity of manuscript leaves on paper. They belong to a variety of texts in Sanskrit, Tibetan, and the unknown language written in Indian characters, already referred to in connection with Dandan-Uilik. The Tibetan leaves, containing, as Mr. Barnett of the British Museum has ascertained, portions of a translation of the Salisthambasutra, a Buddhist canonical text, undoubtedly are the oldest written remains of that language as yet discovered. It was curious to note how the folia which originally belonged to a fairly large manuscript had been cut up and separately deposited, manifestly as votive offerings, at the pedestals of various images. A pious visitor of the shrine had evidently endeavoured to propitiate with his text as many divinities as possible. To other curious discoveries made there, such as Tibetan and Chinese Sgraffitti, small votive offerings of elaborately woven fabrics in silk and cotton, etc., I can only allude here. But as a point of chronological importance it may be mentioned at least that in one of the Chinese Sgraffitti, of which I brought away photographs, Prof. Douglas has since read a date corresponding to A.D. 790.

The proofs of Tibetan occupation showed me that I had reached at Endere the easternmost limits of the territory with the archæological exploration of which I was concerned. So on February 26 I could turn back with a good conscience towards the west, where several sites yet remained to be examined. The journey to Keriya, a distance of over 180 miles, was covered in seven forced marches. The energetic assistance of Khon-Daloi, the Amban, who had followed my movements with the friendliest care and interest, allowed me to set out at once with fresh labourers, transport, and supplies, for Karadong, the ancient site in the desert, some 150 miles north of Keriya, which Dr. Sven Hedin had first visited.

This so-called "ancient city" proved to contain little more than the ruins of a roughly built, quadrangular structure, which probably had served as a fortified *Sarai*, or post, on the ancient route leading along the Keriya Darya towards Kuchar in the north. My excavations at this desolate spot were carried on under considerable difficulties. The height of the dunes which covered the interior of the great quadrangle was considerable, and daily we were visited by sand-storms of varying degrees of violence. The finds, which were scanty, as I had expected, curiously enough included small quantities of remarkably well-preserved cereals, such as wheat, rice, pulse, etc., found embedded in the floor of what evidently was an ancient guard-room.

A series of hurried marches brought me back once more to the vicinity of the present inhabited area. Various antiquarian and topographical considerations made me look out in the desert north of the oasis of Gulakhma for the remains of the town of *Pi-mo*, which Hiuen Tsiang visited on his way from Khotan to Niya, and which is probably mentioned also by Marco Polo under the name of *Pein*. After a search, rendered difficult by the insufficiency of guides and the want of water, I succeeded in tracing it in an extensive *dêbris*-covered site, known as "Uzun-Tati" ("the distant Tati"), in the desert north of the oasis of Gulakhma. Far-advanced erosion and the operations of treasure-seekers from the neighbouring villages have left little of structural remains, but the usual *dêbris* of broken pottery, glass, china, etc., was plentiful.

A close inspection of the conditions under which cultivation is carried on in this vicinity, along the edge of the desert, was very instructive from the point of view of historical topography. I found that, owing to a difficulty of conducting the irrigation water sufficiently far, some villages of this oasis had, within the memory of living men, been shifted as much as 6 to 8 miles further to the south. The crumbling ruins of the old village homesteads, stripped of all that could be of use, are still to be seen. Over miles of ground, which the desert sand is slowly over-running, the lines of empty canals, embanked fields, etc., can be made out with ease. It was the best illustration I could have of the process which many centuries ago must have followed the abandonment of ancient localities like the Niya river site and Dandan-Uilik.

Increasing heat by day and recurring dust-storms warned me that the season was close at hand when work in the desert would become impossible. So as soon as I had returned to the outskirts of Khotan on April 5, I set out for the ancient sites which still remained to be examined in the desert north-east of the oasis. There a discovery of unexpected importance awaited me; for when, after examining Aksipil and other *débris* areas, I arrived at Rawak, of which Turdi, my honest old guide, had spoken merely as "an old house," I found before me a large Stupa, forming, with its enclosing quadrangle, by far the most imposing of all extant ruins of this region. The excavations I at once commenced along the massive walls of the great stupa court revealed a remarkable series of colossal statues in stucco, representing Buddhas or Bodhisattvas, with many smaller relievos between them (Fig. 11). The walls were further decorated with elaborate plaques forming halos, as well as with fresco paintings. The whole of the relievo work had originally been painted.

The careful excavation of this wealth of sculpture was a difficult matter. The interior framework of wood, which once supported the masses of stucco, had rotted away, and, deprived of this support, the heavy images threatened to collapse when the protecting sand was being removed (Fig. 12). The risk was considerably increased by the Burans, which were blowing with more or less violence during the whole of my stay. Extreme care was needed in clearing the statues, and their lower portions had to be covered up again as soon as they had been photographed. An attempt to remove the larger sculptures was quite impracticable owing to the extremely friable condition of the stucco and the difficulties of transport. But of the smaller ones and of pieces found already detached I succeeded in bringing away a considerable number without mishap.

The Rawak relievos show in style and most details of execution the closest affinity with the so-called Græco-Buddhist sculptures of the ruined monasteries and shrines on the North-West Frontier of India. This makes their close study, with the help of the numerous photographs I secured, a matter of great historical and artistic interest. Though no epigraphic or manuscript remains have come to light, the evidence of the numerous coins I found, deposited as votive offerings, goes far to prove that the sculptures of the Rawak Stupa belong approximately to the same period as the ruins of the "Niya River Site."

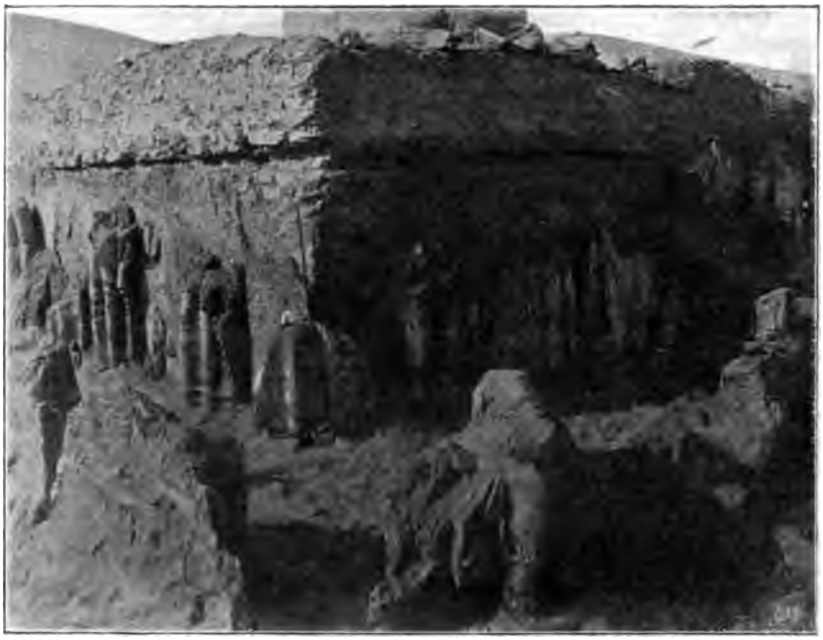

FIG. 11.—RELIEVOS AT OUTER S.E. CORNER OF QUADRANGLE OF RAWAK STUPA COURT.

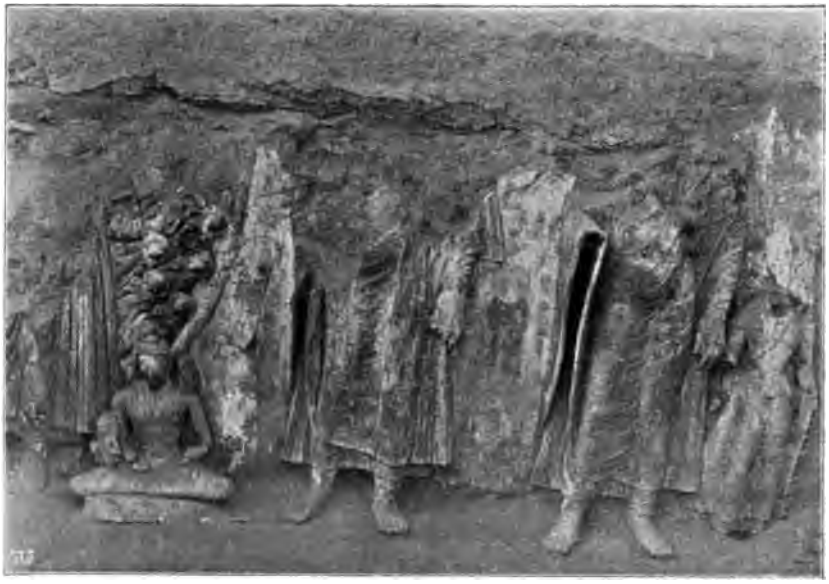

FIG. 12.—COLOSSAL STATUES ON INNER SOUTH WALL OF RAWAK STUPA COURT.

The daily sand-storms, together with the increasing heat and glare, had made the work of excavation at Rawak trying to the men as well as myself. So I was glad when the completion of this task permitted us to withdraw from the desert. On my return to Khotan I was busy with arranging my collections of archæological finds and repacking them for their long journey to London. While thus engaged I succeeded in clearing up the last doubts as to the real nature of the strange manuscripts and "block-prints" "in unknown characters" which had, during recent years, been purchased from Khotan in such remarkable numbers, and which had found their way not only to Calcutta, but also to great public collections in London, Paris, and St. Petersburg. The grave suspicions which my previous inquiries had led me to entertain as to the genuineness of these supposed "finds" had gradually been strengthened almost to certainty by the explorations of the winter. Ample and varied as the manuscript materials had been which rewarded my excavations, I had utterly failed to trace the smallest scrap of writing in "unknown characters." The actual conditions of the sites explored also entirely differed from the conditions under which those queer manuscripts and prints were alleged to have been discovered. There was good reason to believe that Islam Akhun, a native of Khotan, from whom most of those purchases had been made during the years 1895–98, was directly concerned in the forgeries.

After my return to Khotan I expressed to Pan-Darin a wish for a personal examination of this interesting individual. Some days later he was duly produced from a village of the Keriya district, where he had recently been practising as a "medicine man." Islam Akhun's examination proved a lengthy affair. He readily acknowledged his guilt in various recent frauds (including one practised on Captain Deasy), for which he had received due punishment from local Chinese justice. But in the matter of the "old books" he at first protested complete innocence. His defence, however, collapsed in the course of a prolonged cross-examination, and ultimately he made a full confession. The detailed explanations he then furnished of the circumstances which had first led to the conception of these forgeries, and of the methods and materials employed in their manufacture, were interesting enough, and proved, on comparison with the record which had been kept at Kashgar of the purchases, remarkably accurate. Notwithstanding the ingenuity displayed in starting these forgeries, Islam Akhun and his factory "hands" had never succeeded in producing a text exhibiting consecutively the characters of any known script. Also in other material respects it is easy now, in the light of the experience gained through my explorations, to distinguish between his fabrications and genuine ancient manuscripts. There is, therefore, little fear that the forgeries of this clever scoundrel will ever cause deception thereafter.

On April 28 I bade farewell to Khotan town, and May 12 saw me once more at Kashgar under the hospitable roof of my friend Mr. Macartney, the British representative. Since my departure, eight months earlier, Mr. Macartney had lost no opportunity to facilitate my labours. The assistance of the Chinese officials, which was essential for the success of my explorations, had been secured mainly through his influence and unfailing care. For all the help thus accorded to me I wish to express here my feelings of sincere gratitude.

The Government of India had obtained for me permission to travel through Russian-Turkestan on my way to Europe, while Sub-surveyor Ram Singh, the faithful companion of my journey, was to return to India. He had rendered excellent service in accurately surveying the whole of the ground covered by my travels, and had at all times cheerfully borne the fatigue inseparable from rapid marching over difficult ground and from work under trying climatic conditions.

I had been authorized by the Indian Government to convey the whole of my archæological collections to London, and was hence especially concerned about satisfactory arrangements for my onward journey through Russian territory. These arrangements were greatly facilitated by M. Petrovsky, Imperial Russian Consul-General at Kashgar, whose acquaintance I was fortunate enough to make on this occasion. Himself a scholar thoroughly interested in the study of Turkestan history and antiquities, M. Petrovsky did all in his power to assure the safe transit of my collections and to secure for me the friendly assistance of the Russian authorities.

On May 29, 1901, just a year after leaving Srinagar, I started from Kashgar with my antiquities packed in twelve large boxes. There was a great deal of snow still on the Alai passes, but we crossed them without mishap. After having been very kindly received at Osh by Colonel Zaytzeff, the chief of the district, I reached at Andijan the terminus of the Transcaspian railway. By it I travelled to Krasnovodsk, making short halts at Margelan and Samarkand, where much kind attention was shown to me by the provincial governors. From Krasnovodsk I crossed to Baku, and finally, on July 2, I arrived in London, where I had the satisfaction of depositing the antiquities unearthed from the desert sands in the British Museum as a safe temporary resting-place. Neither they nor my eight hundred odd photographic negatives on glass had suffered by the long journey.

The twelve weeks of special duty allowed to me in London barely sufficed for the rough arrangement of my collection and the preparation of a Preliminary Report,* though, in regard to the former task, I enjoyed the benefit of the expert help of my friend, Mr. F. H. Andrews, late Principal of the Lahore School of Art.

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* 'Preliminary Report on a Journey of Archæological and Topographical Exploration in Chinese Turkestan.' Published under the authority of H.M.'s Secretary of State for India. 71 pp., quarto, with 16 plates and 13 photographs. London, 1901.

After my return to India heavy official duties as Inspector of Schools in the Punjab left me no time whatsoever for scientific work. The Government of India, however, have since generously accorded to me a period of eight months' deputation in England, and with the temporary leisure thus assured to me I am now endeavouring to prepare a detailed Report, which is to render the results of my journey fully accessible for further researches.

Before the reading of the paper, the PRESIDENT said: The communication we have to receive this evening is from Dr. Stein, who was appointed by the Government of India to explore a portion of Chinese Turkestan. I think I may promise you that the paper will remind you of the days of Sir Henry Rawlinson and Sir Henry Yule. I will now ask Dr. Stein to read his paper.

After the reading of the paper, the PRESIDENT said: I think there is a debt that we owe, before referring to the valuable paper that has been read to us, to the Government of India. We are bound at this meeting to express our sense of the liberality and the public spirit which has led the Government of India to give such encouragement and assistance to the investigations of Dr. Stein. I do not think we shall be far wrong if we attribute that impulse of public spirit in this direction to our associate Lord Curzon, the Viceroy of India. It was very pleasant, also, to hear of the great assistance which was given to Dr. Stein at Kashgar by Mr. Macartney and by the Russian Consul-General, and above all it was very pleasing to us to know that the Chinese authorities throughout this great region are not only glad to help our travellers, but take an intelligent interest in the work they are doing. With regard to Dr. Stein himself, I think we must have all been impressed with the value, in the first place, of his geographical work, both on the road to Kashgar and to the south of Khotan, where he appears to have executed very valuable surveys, having been able to connect his work with several trigonometrical points of the Indian Survey. It would be almost impossible to exaggerate the great value and importance of his archæological and historical investigations, and for us as geographers it shows, in the first place, the great importance of a traveller having been thoroughly trained for the work he undertakes, for we can see from the paper that Dr. Stein had at his fingers' ends the records of Hiuen Tsiang and the other Chinese pilgrims of more than a thousand years ago, as well as almost everything else that has been written upon the subject of this region. He thus went to the country ripe for the work he had before him, and he has done his work very thoroughly and under very great difficulties. As geographers, we see how important these historical and archæological investigations are to our science; Mr. Vaughan Cornish would have been deeply interested, if he had been here, in discussing the real causes of the encroachment of sand upon civilized regions to the north of Khotan. It must be evident that once there was a very large population there, and I understand from Dr. Stein that it is his opinion that the ruin was due more probably to the falling off of the population and consequent neglect of irrigation works than to any of the forces of nature. If that be the case, there is in the future, as there was in the past, the possibility of a great and fertile irrigated region taking the place of the desert. All these points are suggested by the most interesting paper of Dr. Stein, and I scarcely ever remember listening to a paper which was so thoroughly well illustrated by excellent photographs. I feel sure that we all desire to pass a very cordial vote of thanks to Dr. Stein for his communication.

NOTES OF A JOURNEY THROUGH UGANDA, DOWN THE NILE TO GONDOKORO (JULY, 1902).

By Sir C. N. E. ELIOT, K.C.M.G., C.B., H.M. Commissioner and Consul-General, East Africa Protectorate.

THE journey from Kampala to Butiaba, on Lake Albert, can be done in about four days with a light trap and relays of mules, provided there are no unfavourable circumstances, according to an itinerary kindly prepared for me by Mr. Purdage, Superintendent of Public Works in Uganda, and verified by my own experience. The stations and distances are as follows :—

Kampala to—	Miles.	Kampala to—	Miles.
1. Kisimbiri	9½	9. Yilo	9⅛
2. Kikandwa	10¾	10. Kikonda	16¾
3. Nkvanuna	13½	11. Kigonna	8½
4. Kabula Muliro	11¼	12. Hoima*	10
5. Kative	9⅛	13. Kajura	12⅞
6. Kisingo	15½	14. Wachi	8¾
7. Kiboga	9¼	15. Butiaba	5¾
8. Kigoma (rest-house)	5½		

When I made my journey, a couple of mules were provided at each of these stations. They did not seem to be of bad quality; but the climate, which probably means the grass, of Uganda and Unyoro is very unhealthy for all cattle and transport animals, and the mules were accordingly very weak. I found they were capable of doing 9 or 10 miles in about an hour and a half, but for longer distances the proportion diminished rapidly, and a stretch of 15 miles took five hours. Hence it was often difficult to get through the daily average of about 40 miles. The Government have provided most excellent rest-houses at Kabula Muliro, and Kigoma, where the traveller can pass the night in perfect comfort. It is also possible to sleep at the intermediate stations, as the natives are very civil and ready to supply food. Up to Kigoma the road may be said to be generally good, and for long stretches excellent. Afterwards it proved somewhat heavy going, as the soil was loose and not beaten down. About a mile before Kikonda is a short but very steep hill. I had to unharness my mules and send on for fresh ones to the next station, while the cart was dragged up by a band of natives. The road should, if possible, be rectified here, for I doubt if any pair of Uganda mules will be able to climb this incline, the more so as they approach it at the end of an unusually long stage. The road from Hoima to Lake Albert is not so good as the other sections. It consists of a series of very steep hills. The descents are almost dangerous, and the ascents so difficult that it is generally necessary to dismount and sometimes to unload the trap. If there is any intention of establishing a trade route, this district should be resurveyed with a view to the construction of a new and more level way, which I should think would prove practicable, as the elevations to be traversed are not a series of ridges, but separate hills, which look as if they might be circumvented. If it proves impossible to keep transport animals in health, we might consider the propriety of imitating the example of the Belgians, who use automobiles for the carriage of goods in the Congo Free State. The Uganda road would no doubt have to be strengthened in parts for such traffic, particularly where it crosses marshes, but I should say the greater part of it would stand machines with broad wheels.

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* Government station.

The scenery in Uganda and Unyoro is very monotonous. The country consists of an undulating plain profusely sprinkled with low hills. Hills and plain alike are covered with a strong thick grass 4 to 6 feet high, among which grow scattered trees, rarely uniting to form anything which can be called a forest. But for the great height of the grass the landscape is, as so often in Equatorial Africa, somewhat like an English park. There were fewer villages and less cultivation than I had been led to expect, but what houses and fields there were seemed well cared for, and I met many natives taking sheep, fowls, and vegetables to market. As in Kampala, the villages and fields were surrounded by wickerwork fences. The weather was surprisingly cool, even cold, and the mornings and evenings were like an English October. If it could be taken as an average specimen of the climate, I should say that the country was perfectly suited for European colonization, but it would be most unsafe to judge from a single visit, for the heat and damp may perhaps be excessive at other seasons. The land appears to be fertile, and, when once the tall grass has been removed, will grow almost any kind of vegetables. Throughout the whole distance between the two lakes there is a strange absence of animal-life. Tracks of elephants are occasionally seen, but whatever game there may be is entirely hidden in the vegetation; even birds are rare. Butterflies, however, are abundant. They feed greedily on muddy parts of the road, particularly where there is a little foul matter. On such places may be seen large white or yellow spots formed by incalculable numbers of these insects, which are so occupied in drinking that they allow a carriage to drive over them. Many are attacked by ants while thus engaged, but are so absorbed by their unclean banquet that they do not notice that they are being eaten at one end while they are drinking at the other.

I have often heard it said that Lake Albert is surrounded by steep cliffs which descend sheer into the water, but this is a mistake. At Butiaba, and I believe in other parts, the lake is surrounded by a fringe of low-level land 2 or 3 miles broad. The descent from the hills is somewhat precipitous, but can hardly be said to form cliffs.

There is no good drinking-water beyond the base of the hills; that of the lake is very bad. When I was at Butiaba it was of a brilliant green colour, caused by the presence of innumerable minute organisms, which had been driven by the wind into the bay. All the people who drank this water had violent fever. There is no station as yet at the lake, but merely a few buildings for the accommodation of travellers and their stores. The transport-camp is about 3 miles from the lake, and in the hills. The lake can also be reached from Hoima to Kibero, south of Butiaba. But this road is longer for those going to the Nile, and, I believe, has fallen out of repair.

The journey from Butiaba to Nimule by the Nile is reckoned as 165 miles, and can be done in five days—that is, camping four nights on the shore—if the rowers are good and the wind not unfavourable. One camp should be sufficient between Butiaba and Wadelai, and two between Wadelai and Nimule; but sometimes two are necessary in the first stage, and four in the second. The journey up-stream takes ten or twelve days. From Butiaba to Wadelai the voyage is performed in a large steel boat, which goes best under sail. At Wadelai this is exchanged for a smaller craft, also of steel, which depends mainly on rowing. It is proposed to place a steam-launch on the river shortly. The whole river up to Nimule presents a series of singularly beautiful and varied views, especially after Wadelai, when it runs between mountains. The ordinary breadth of clear water, not counting swamps, is about 200 yards, but the stream sometimes divides into several narrow channels, and sometimes broadens out into small lakes. I should say that at the time I saw it (the middle of July) the current was about 3 miles an hour. The real bank is seldom visible, being concealed behind a mass of lilies and other aquatic plants, which grow so close as to present the appearance of solid ground. They are not, however, a compact mass like the sud, and a boat can easily force its way through them. In the open stream float masses of a plant which I believe to be the *Pistia stratiotes*, described by Baker. They unite to form small islands, which are not, however, large or strong enough to obstruct navigation, and are dashed to pieces on the rapids below Nimule before they have time to attain formidable dimensions. A remarkable feature of this part of the Nile is the great abundance of hippopotami, which, unlike those of most East African rivers, lift their whole head and neck out of the water when they rise instead of merely showing their ears and nostrils, doubtless because they have not been much attacked by man. I rarely went a quarter of a mile without seeing at least one, and troops of from twenty to thirty individuals were numerous. There are many well-authenticated stories, which can hardly be rejected, of their attacking boats; but I saw absolutely nothing which supported the idea that they might be a danger to navigation. When close to the boat, they seemed frightened and dived; when distant 20 yards or more, they took no notice at all. All kinds of water-birds are also very abundant and fearless.

Immediately after Nimule begin the rapids, which render the river unnavigable up to Bedden, about 30 miles above Gondokoro. This latter station and Nimule are connected by two roads, neither of them good. One keeps close to the Nile, and was impracticable when I made the journey, as it was under water owing to recent rain;[*] the other runs further inland. It cannot be said to offer adequate means for communicating between two Government stations, or for the transport of any sort of goods. For a great part of its course it is obstructed by marshes, thorn bushes, or grass 6 feet high, but here and there it passes through pleasant open meadows, studded with large trees. Part of it consists of precipitous paths cut in the rock, and it is crossed by many rivers, at least three of which, the Assua, the Karpata (?), and the Kit (or Kiti), present serious obstacles to the foot-passenger when in flood, as I found them. The first is crossed on rafts made of ambatch, a very light wood. The natives show considerable skill in guiding these rafts across the torrent, but the passenger or load is generally half submerged. The two other rivers have to be crossed by wading, and are about 4 feet deep. The Kit was about 150 yards wide. The whole journey took me seven days, that is to say, six night camps. The distance is between 110 and 120 miles.

There are three Uganda stations on the east bank of the Nile, Wadelai, Nimule, and Gondokoro; and three Belgian stations on the west bank, Dufile, Lado, and Kiro, besides Mehagi on Lake Albert. The name Wadelai is most indistinctly pronounced by natives, and sounds more like Ororai or Ululai. This indistinctness of utterance seems characteristic of the Nilotic tribes, and is no doubt partly due to the habit of knocking out the front teeth. The British station of Wadelai is situated on a hill about half a mile from the river, and opposite Emin's old fort of the same name. The situation seemed to me advantageous and healthy, and the buildings as good as can be expected, seeing that they are entirely constructed with local materials, and by local labour. Nimule, which lies immediately before the beginning of the rapids, is also well situated. The military lines and some of the officers' houses are on a small plateau overlooking the river, and other bungalows are on a higher hill about half a mile further back. Gondokoro lies on the bank of the river, and is somewhat swampy and feverish.

Mehagi, the most southerly of the Belgian stations, is beautifully situated 1800 or 2000 feet above Lake Albert. The air and climate are excellent, and European vegetables grow well. There is only one officer and one house. It is about four hours by road from the lake. Old Dufile was also situated about four hours from the Nile in a high and healthy situation, but the station is now being transferred to New Dufile on the Nile, about an hour and a half above Nimule. Rejaf, Lado, and Kiro are all situated immediately on the bank of the river. The last-named is the administrative centre and the residence of the chief authority in the Enclave, but Lado is the larger place. Rejaf is a small station situated at the base of a remarkable pyramidal mountain with a curiously notched summit; it supplies men for a small military post opposite Gondokoro, from which it is distant 10 or 12 miles to the south.

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[*] I am told by Mr. Pordage that the halting-places on this road are as follows: (1) Assua river, 11¼ miles; (2) Rake village, 11 miles; (3) Mruli, 12 miles; (4) Lokoya, 12½ miles; (5) Tambur, 12¼ miles; (6) Kogi, 9¾ miles; (7) Nagua, 10 miles; (8) Fort Berkeley, 12 miles; (9) Ibrahim's village, 12 miles; (10) Gondokoro, 10 miles.

It has sometimes been said that the Belgian stations are much better built and furnished than the British ones. It is true that all the European quarters are made of bricks, not wattle; but, with this exception, the accommodation did not seem to me superior to ours. All the stations except Mehagi are unhealthy, being surrounded by marshes. In order to develop the Congo roads, the Government does not import any stores down the Nile, but brings everything by land from Boma, which takes from four to six months. As mentioned above, automobiles have been introduced for transport, and are said to answer fairly well. It is also said that six elephants have been trained and are used for transport in the Welle country.

For the whole length of the Enclave the country near the river presents much the same features on both sides, consisting of a plain covered with thick grass, from which rise abrupt hills forming either chains along the bank or isolated masses. Thickets of shrubs and small trees are frequent, but I saw nothing that could be called a forest. Large timber is, however, to be seen here and there on the road between Nimule and Gondokoro, and between Wadelai and Nimule there is said to be a small forest of fine trees, which grow 40 feet high before they branch and yield a red wood excellent for building. No indiarubber or other vegetable products of value have been reported. There is very little cultivation for 5 or 10 miles from either bank, as the inhabitants retired from fear of the dervishes, and have not yet made up their mind to return. The soil, however, is fertile, and yields native grain in abundance, while the gardens which have been planted round the British and Belgian stations are fairly successful. Tropical vegetables, such as the papai, banana, and sweet potato, naturally thrive. European potatoes cannot be reared, but beans, tomatoes, lettuce, cucumbers, and kohl rabi flourish. From experiments made at Mehagi, it seems probable that European plants would do well on the hills. The supply of food for the troops is, however, a serious problem, and must remain so for some time—until the natives can be induced to return to the river-banks. At present it is solved on our side by the women (of whom the harems of our Sudanese seem to contain inexhaustible troops) making journeys of as much as six days from camp to procure provisions. These women are the most industrious and indefatigable creatures in the world. Unless quarrelling, they seem to be always at work, and will do in the day as much as a man and a beast of burden combined.

I am afraid to give a favourable account of the climate of the upper Nile (by which I mean the Nile between Lake Albert and Gondokoro), for it is notoriously unhealthy, and I have no doubt that my experience was exceptionally fortunate, even taking into account the fact that I travelled in the good season. Up to Gondokoro I did not suffer from either heat or mosquitoes, and was only inconvenienced by occasional storms of rain. Probably the plains can never be a suitable residence for Europeans, but from what I have heard I think the hills offer an agreeable and healthy climate. Officers who had visited Latuka country to the east of Gondokoro told me that it was as healthy and pleasant as the highlands of East Africa, and the scenery magnificent.

The following are the chief native tribes met with going down the Nile from south to north. Externally, they are all characterized by the absolute nudity of the men (the women being clothed), and by a curious habit of standing on one leg, against the knee of which they press the foot of the other. The Lurs inhabit the north end of Lake Albert and both banks of the southern extremity of the Nile, but do not extend much to the north of Wadelai. There are a good many of them in the King's African Rifles, but they are not warlike. The name is variously written Lur, Luri, Alur, and Alua. They are expert and industrious fishermen. Next to the Lurs come the Shulis (also called Acholis), whose proper territory appears to be to the east of Wadelai. They have, however, spread to the north and invaded the Madi. Now their villages are mingled with those of the Madi, on the eastern bank all the way from Wadelai to Nimule. They are fairly warlike, and superior to either the Madi or Lurs. Their country has a good food-supply. They wear in the underlip a skewer of white glass, made by grinding down bottles. Bottles made of thick white glass are hence much valued, but black ones are not esteemed.

North of the Shuli on the east bank come the Madi. This is the tribe of which the traveller sees most between Wadelai and Gondokoro. They are lazy and timid, having been severely defeated by both the Dervishes and the Shulis, with the latter of whom, as mentioned, they are much mixed up. They show no desire to trade, but make fair porters.

The men, as usual, are quite naked, although some of the chiefs put on cotton clothes on state occasions. They wear helmets made of the hair of their ancestors, matted into a sort of felt, and covered with a pattern in white beads. Their villages are circular, and surrounded by a wooden fence. In the middle are the stores, which resemble little huts set upon poles 3 or 4 feet high. On the outside of the circle are the dwelling-houses, consisting of circular huts made of wood and thick straw, with a very low door, through which a man can hardly crawl. In rocky districts the framework of the hut is sometimes set upon stone pillars. The villages of the other tribes mentioned seem to resemble those of the Madi in their general characters. A little to the north are found the Baris, who inhabit both banks of the Nile between the Madis and the Dinkas. They are tall, fine men, and both in physique and courage far superior to the Madis. They are also very intelligent, and learn writing with remarkable rapidity. They are mostly naked, but anxious to trade and buy cloth, and they fully appreciate the value of the rupee.

They seem well disposed, and have begun to pay a little hut-tax. The people who inhabit the first range of hills behind Gondokoro are called Kookoya, under a great chief called Lewala. They are possibly akin to the Bari, but present, at least, superficial resemblance to the Masai. Like that tribe, they paint themselves red and wear their hair in curls, and, like them, they have rain-makers, who are important political personages. Their weapons are bows and arrows and barbed spears. Behind the Lokoya country are the Lirian hills, inhabited by a very fierce tribe under a chief called Lue. They are much feared by the other natives, but I could obtain no information as to their affinities. Behind the Lirian hills comes another hilly country, the Latuka district. The tribe is divided into several sections, one of whom obey a queen called Tapen. They are warlike, but apparently not hostile to the British Administration, though hitherto we have had hardly any dealings with them. They are good workers in iron, and are very fond of brass wire, which they beat into helmets. These brass helmets, with red plumes inserted in the centre, form their head-dress on ceremonial occasions.

Of the tribes mentioned, the Lurs, the Madis, and the Baris are all found on the Belgian side as well as on the British. Between Lake Albert and Dufile, however, there are very few inhabitants. The Cuckoos and Quackquacks, who have aroused some mirth and scepticism, are, in spite of their curious nomenclature, real and important tribes. The names should apparently be written Kuku and Kakkwa. We have representatives of both in the King's African Rifles at Nimule, whom I questioned. The two tribes and the districts which they inhabit appear to be similar, but they fight (or, at any rate, used to fight) with one another. Their country is said to be very fertile, and to support immense herds of cattle and sheep. Both are powerful and warlike tribes, and in our service they make good soldiers. According to my informants, the Kukus live seven days' journey from the Nile, and the

Kakkwas twelve. These figures are probably exaggerated, even if we allow that the road is very bad, and it seems likely that the Kuku country is not more than 30 miles from the river. At least two villages of Kukus have migrated from Belgian to British territory. I passed through one on the third day from Nimule.

Another tribe to whom the Belgians attach importance are the Makrakra, or Makaraka. Their home appears to be at some distance from the Nile. They are said to be cannibals, but are brave men, and useful as soldiers. The Bongo appear to furnish the majority of the Belgian soldiers, and their idiom has become the general language of the Congo, like Swahili in East Africa. They are said to be good men as askaris and police.

The Mittu, or Motto, are said to be found on the hills behind Dufile, two or three days' journey from the Nile, though this is not quite the position assigned them by previous travellers. They are reputed to be very good iron workers, and to make spears, hoes, etc. Their country is fertile. There are several of them in the King's African Rifles. The best known of their subdivisions is the Abukaya.

The Moru are also represented in the same corps, but are not considered a good class of men. Some of them are cannibals. The name of the Kederu seems to be unknown. I need hardly say that it is often very difficult to obtain the correct designation of African tribes, as the names which they use themselves are often not those by which they are known to other natives.

The Mandu and Mangbattu are mentioned as important tribes in or near the south of the enclave, but I could hear no more about them. I am assured that the Dinkas lie entirely outside the limits of the enclave. They are all very tall men, but somewhat thin. They make excellent soldiers, and even native officers. They wear no clothes, but in other respects they have reached a fair level of semi-civilization, and have good houses. Those inland have considerable flocks of cattle, but those near the river live entirely by agriculture. They have a chronic feud with the Nuer, who appear to generally get the better of them. To the east of the Dinka are the Berri, of whom little is known except that they are a warlike and intractable race.

There does not at present seem to be much prospect of a trade-route being opened between Uganda and the Sudan. The known valuable products of the former country, such as indiarubber, come from the eastern districts; nor is there any considerable demand for imports from either Europe or Uganda in the Nile valley or neighbourhood of Lake Albert. If, however, minerals were discovered in that region and a considerable mining industry sprung up there, the Nile route might be found the quicker and cheaper, though, no doubt, the fact that the Uganda railway is already in existence would tend to make commerce follow that road for some time. Taking Lake Albert as a centre, the two routes may be compared as follows: To reach the sea at Mombasa there is first a journey of 160 to 180 miles by a fair road to Lake Victoria, then the crossing of the lake, and then a railway journey of nearly 600 miles. To reach the Mediterranean, there is a journey of about 165 miles down the Nile from the shores of Lake Albert to Nimule, then 110 or 120 miles by land across a district where there is at present nothing but a bad native path—namely, from Nimule to Gondokoro; then the long water journey from Gondokoro to Khartum, which presents certain obstacles, owing to the scarcity of wood and difficulty of finding fuel; and then another lengthy journey to Alexandria, which, owing to rapids, requires at least two transhipments. Of course, the sea will be reached much more quickly if Berber and Suakim are connected by rail.

I see no reason why the Nile valley should not prove a fairly expeditious route, if the necessary means of transport in the way of boats, etc., are provided. The time which I actually spent in going from Mombasa to Gondokoro was twenty-seven days. Deducting all stoppages, the journey might have been done in eighteen or twenty days. It is true that, owing to the courtesy and energy of the Uganda Administration, I travelled with considerably greater speed than an ordinary traveller could attain, but, on the other hand, after reaching Lake Albert, the available facilities are at present very small. When a steamer plies from Butiaba to Nimule, and a road is made from the latter place to Gondokoro with proper arrangements for transport, an ordinary person travelling direct ought to do the journey from Mombasa to Gondokoro in a fortnight.

At any rate, the primary necessity for opening up the route is to institute proper communication between Nimule and Gondokoro. I think there would be no difficulty in making a carriage road such as that which connects Lakes Victoria and Albert. In one or two places embankments would be necessary to cross swamps, and about four easy bridges would have to be constructed; but the country is fairly level, and does not present any obvious difficulties either for a road or a light railway.

TO THE JOF AND BACK.

By the Rev. A. FORDER, of Jerusalem.*

LEAVING the Holy City, with one attendant, I reached the large Druze settlement of Orman, at the extreme edge of the Eastern Hauran, after several days' journey. I was interested in seeing the massive ruins in some of the villages of the district, and was fortunate in getting some good photographs of the old stone doors, of which very few now remain. Between Busrah and Sulkhad we were overtaken by a heavy hailstorm, which beat upon us with such force that we lost the track and eventually got landed in a hamlet named Manathri (El-Muneidhirah?). Here I was shown a very long and distinct Greek inscription that had been unearthed a few days before, but on proceeding to copy it, I aroused the anger of the villagers, who sent me away as quickly as possible. Orman has little to interest; here and there, in the walls, are fragments of capitals and columns, and a few well-preserved Greek inscriptions. The people are industrious, sowing quantities of peas and wheat, which they dispose of in the bazars of Damascus. Whilst at this place my attendant left me, and I heard of a caravan which was about to set out for Kaf, a place some six days' journey south-east, which is usually called by the natives Kuryetain, from the two villages of which it consists, as I found later on. After some bickering and arguing, I was allowed to join the caravan, which was composed of about 1600 camels, laden with wheat that was to be bartered for salt. Two hundred horsemen protected this large caravan from the attacks of hostile Arabs. Incredible as it may appear, we covered the distance between Orman and Kaf in about thirty-six hours, resting only twice for about fifteen minutes. Dread of Arabs made us press on, and the more so as we were attacked once, but, being fortunate enough to capture two of the enemy, disarmed them and forced them to accompany us to within sight of Kaf. I was glad to find myself in the village square, formed by mud-brick houses of the rudest and most primitive style; wood being scarce, they were doorless. The people crowded round me and asked one question: "Are you come to reveal the treasure hidden in the ruins of Tell Si-e-di?" They pointed to a fine tell crowned with ruins, which I had inwardly resolved to explore, if there was any chance of climbing the hill. The excited crowd lost no time in forbidding me to ascend the hill and examine the ruins. No Christian had ever done so, and death was the penalty of an attempt. After much opposition, I ascended the tell. At one time it must have been a strong place, and the remains of well-preserved cisterns and chambers show that it could have withstood a long siege. I was not allowed to make drawings or move any stones, and saw nothing that would throw any light on the history of the place. There was little else to interest save the palm groves, and the rude way in which the natives procured the salt supplied to the caravans that came from all parts of the peninsula, Syria and Palestine. For about a mile round the village there are numerous strong brine-springs. The brine is drawn up in skins and poured into shallow beds in the sand; evaporation quickly takes place under such a hot sun, and a thick deposit of salt, white as snow and in large crystals, is left. This is gathered before it is quite free from water, piled up in the sun to dry, and then carried to the village, where it is stored in large mud bins to await buyers. The money value of a sack of salt is about 7½*d.* This gathering of salt, and the cultivation of the date palm, keep the Kafites busy all the year round. The population of the two villages would not number more than a thousand men.

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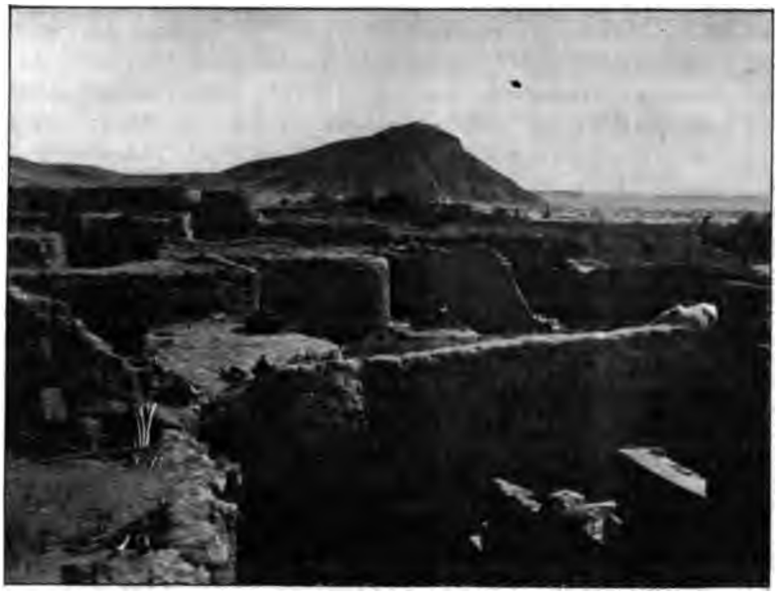
* The following notes of a journey, made, for missionary purposes, by the Rev. A. Forder, to Jof, in Northern Arabia, contain interesting remarks upon the people and places visited. The photographs are new. For the recent history of Jof, see Palgrave, 'Travels in Arabia;' and for a previous visit, see Blunt in R.G.S. *Proc.* (N S.), Vol. ii. p. 81.

The sheikh of Kaf was kind to his unwelcome visitor, but soon began making plans to get rid of me. The caravan returned as soon as business was over, and the chief would gladly have returned me with them. After five days' stay, he sent me away to a smaller place about 12 miles south, named Ithera, where salt was also found, but in less quantities. Here my experiences were far from pleasant, and I have never, during my ten years' sojourn among Arabs, met a ruder or more fanatical lot of men. Kaf in every way was a paradise to Ithera. Here again, on a lofty tell, there were remains of old masonry, but I was not allowed to approach the hill. On the lintel of an old door, leading into what had been evidently the stronghold of the place, I saw some characters which I conjectured were Nabathean, but no opportunity was allowed me to examine or copy them. A good spring in the midst of the place supplied the natives with water. Here many abominable things were done to me.



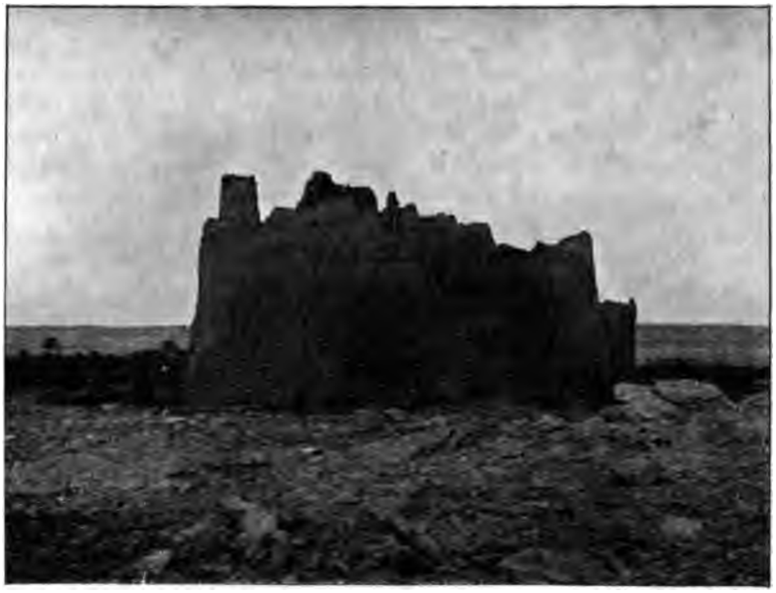
A BIT OF ITHERA, SHOWING ITS IMMENSE TELL.

Ithera has about two hundred houses, all in a sad tumbledown state. The bricks, made only of slime and sand, soon tumble to pieces, and the Arabs have not energy enough to repair anything until it is absolutely necessary. My first stay in Ithera only lasted three days; then I joined a small party that was leaving for the Jof, the principal town in North Arabia. That start will ever be memorable from the volleys of curses, oaths, and threats that were hurled at me by my travelling companions, whose feeling toward me was not improved when, a few hours later, we had a hard fight with a wild band of Beduin that cost us two lives. For all this I was blamed.

For ten long weary days we went on over the desert, ofttimes hungry and thirsty, allowed no time to rest for fear of enemies, and driven off the track of springs by the presence of a supposed foe; one night almost suffocated in a sand-storm, seeking shelter under cover of even a sack of salt. At last, on the afternoon of the tenth day, we saw ahead the magnificent old castle called by the Arabs "Mared." As we got nearer it increased in size, and, as I rode past it on my camel, I had an opportunity of seeing it closely. I was not allowed by the Arabs to get so near again, although I did venture to snapshot it with good result. It is nearly round, and entered by a door halfway up, which is approached by a small rude stairway. I was told that there was a fine spring inside, and that the castle was only opened once a year. My host aggravated me sorely by telling me of a long inscription on a stone that was safely stowed away inside; but I could not persuade him to let me have a look at it. The Jof, as the name indicates, is a wide depression in the desert just on the edge of the treacherous Nefud. In length it is about 2 miles, and in breadth not more than one-third. Copious fresh-water springs account for the prosperity of the thousands of palms, yielding yearly a rich harvest of several varieties of dates, which constitute the everyday food of the Jofis. Several warm sulphur springs are used by the people for medicinal purposes. The absence of shops makes the people dependent on traders from Baghdad, Mekka, or Damascus—most of the trade being done by bartering. I found the old Maria Theresa dollar in circulation under the name of "Shushi." At first sight one would think this beautiful oasis thinly populated, as the houses, some three stories high, are hidden away in the palms. The governor told me that he took a yearly tax of about 3*s.* 4*d.* from 40,000 men who resided in the town.

Here they have a peculiar mode of serving out their coffee, of which they drink large quantities of the best quality, brought from Yemen. On making a pot of the beverage it was all drunk, none being left over to be warmed up some hours later. I noticed too that, unlike any other Arabs I had seen, the pourer-out kept on giving coffee to one person until he prevented him. Usually one small quantity is given, followed by another a few minutes later on, but it is not so at the Jof.

Many of the men spend much of their time at rude looms making saddle-bags and abbas (native cloaks); the Jof is held in high repute for the making of these two necessities of the Beduin. The care and cultivation of the date palm give the people plenty of work; every third day the trees are watered, camels and cows being used to draw the water from the numerous deep wells in the town. Very little grain can be grown there, since the great heat quickly scorches up any green stuff. I was told the rainfall consisted of three or four showers only, and those about February. I saw one smith and one carpenter; their tools were limited and primitive, but they produced fairly good work. The women of the Jof are strictly secluded; not so those of Kaf and Ithera, who were as free as the Beduin women. Wood is scarce, and is brought in from the surrounding deserts; men go out in parties to gather what they need. Fruit is plentiful. I saw in the groves and gardens apricot, plum, quince, citron, lemon and apple trees, vines and figs; tomatoes, melons, cucumbers, squash, beans, and onions are grown in abundance, so that the Jofis are not badly off in spite of the absence of bread, which is a luxury. A little milk is obtainable from a few goats and half-starved cows; the town-people depend on the nomads for their supply of fat and sheep, the latter being worth about 7*s.* a head.



OLD ARAB CASTLE AT THE JOF.

The Jof is governed by a chief, who is tributary to Abdul Aziz ibn-Rashid, sultan of Nejd, resident in Hayil, six days' journey from the Jof. This chief of the Jof exercises a wide influence, not only over the town, but also over a large town named Sakaka, which is only about eight hours' ride from the Jof, and has a population of about 30,000 people; few maps have this place marked on them. The residence of the chief of Jof is not without interest—a castle about a quarter of a mile from the town, in which he lives and holds his daily court. It is built of stone and brick, has three walls, each separated from the other by a space of about 20 feet, the private apartments being in the centre. One entrance gives admission to this unique palace; the door, plated with heavy sheet-iron, is guarded by a band of bloodthirsty men ready to do their master's bidding. No one is admitted without permission of the chief. I was allowed inside twice, and noticed an antiquated cannon just inside the first wall. On each corner of the outside wall there is a tower about 50 feet high. These command a wide view, and from them the approach of caravans, travellers, or enemies can be reported. Every arrival at, or departure from, the Jof has to be notified to the chief, and very little can be done or take place without his consent. I had a few interesting talks with this eminent personage, and was particularly interested in the account he gave me of the visit of Prof. Euting and his companion to Nejd many years ago, and especially of the murder of the latter by the Beduin.

My stay at the Jof came to an end after a fortnight. I intended going to Hayil, but the severe fighting between Mubarek, the sheikh of Koweit, and the sultan of Nejd, together with the absence of the latter from the capital, made the advance inadvisable, if not impossible just then. So with many regrets and pleasant farewells, I bade goodbye to the few friends I had made in this little-visited oasis in the desert of Jebel Shomer. An invitation from my host, the son of the chief, to revisit them in the date harvest, is not without hope of being accepted.

To the ambitious traveller seeking for new fields to explore, there is ample scope, and a prospect of ample reward, in the country between Syria and Nejd; only whoever sets out on such a trip must have a good supply of patience, pluck, and common sense, added to a knowledge of the language and customs of these most interesting people. My return was one full of exciting incidents and experiences, which need not be mentioned here. I was absent just three and a half months, and, owing to the absence of post or telegraph, no news of my movements were obtainable. A false report was circulated in the bazars of Jerusalem by some Beduin that I had been murdered; but I am yet alive, and looking forward to a return to the Jof and the regions beyond.

SURVEY OF INDIA. REPORT FOR 1900-1901.

The Government of India Survey Report for 1900–1901 contains the usual excellent record of work accomplished by the Survey Department under the administration of Lieut.-Colonel St. G. Gore, R.E. It has been issued in a somewhat abridged form by the omission of the narrative reports of the officers in charge of the various parties—an abridgment which certainly reduces the bulk of the Report, but at the same time considerably curtails the interest of it. With the exception of the interesting record of Lieut.-Colonel Renny Tailyour's experiences with the China Field Force, there is nothing in the way of narrative included.

Field operations during the season under review were carried on by one double and sixteen ordinary parties and three detachments. Of these, only one was employed on principal or geodetic triangulation. A new principal series, "The Great Salween," has been started from the Mandalay meridional, and a minor series, the Minor Manipur meridional, was in course of extension.

Eight parties were occupied in topographical work, one double and one ordinary party on forest surveys, and the rest divided between cadastral and traverse surveys and scientific observations. Four of the topographical parties were in Burma, and the rest in Sind, the Punjab, Kashmir, the Lushai hills, and the Kangra or Simla districts. The forest survey parties were distributed throughout India, and the cadastral were employed in Burma and the North-West Provinces—which, by the way, are now known (in conjunction with Oudh) as the United Provinces. This sufficiently indicates the present scope of departmental work. Nearly 17,000 square miles of topography and 5000 of forest survey is a very creditable total to show as the result of the season's work under this head. Geographical surveys and reconnaissances were restricted to Kashmir, China, and the North-West Frontier. Sixteen thousand square miles of China have been triangulated, and 17,000 mapped on geographical scales. Twenty thousand square miles represent the fresh mapping of the border-lands, and more than 3000 have been added to our Kashmir credit. If previous records of this class of mapping have been larger, it must be remembered that previous opportunities have been greater. With all China and a large area in Persia and Afghanistan still open to geographical enterprise, we can hardly say that we are within a measurable distance of the end to map-making of a geographical, or exploratory, nature in connection with Indian surveys; but the opportunities afforded by these most fascinating regions are but intermittent, and not to be reckoned on with any certainty.

Two subjects of special scientific investigation must be mentioned as being of general interest to geographers.

The first is "the recalculation of the attraction of the Himalaya mountains upon the plumb-line." The original calculation was made by Archdeacon Pratt in 1854. The result of the two calculations give the following deflections of the plumb-line on the meridian:—

	1854.		1901.	
At Dehra Dun	—	seconds ...	72·2	seconds
„ Kaliana	27·85	„ ...	36·2	„
„ Kalianpur	11·97	„ ...	18·4	„
„ Damargida	6·91	„ ...	10·0	„
„ Cape Comorin	—	„ ...	3·4	„

"The problem of Himalayan attraction has never yet been solved." Archdeacon Pratt's conclusion was that compensation in attraction was induced by varying conditions of density in matter composing the Himalayas and that part of the Earth's crust which lies immediately beneath them; so that, in effect, "this great mountain mass exercised no influence on our plumb-lines."

But actual observations show that the deflection at Dehra Dun (at the foot of the Himalayas) is greater than that at Kalianpur (Central India) by 38″; and the above calculations, based on the theory of gravity, would make this difference 54″. This result is supported by other observations in sub-Himalayan regions, all of which tend to contradict the theory of compensation. But, on the other hand, how is it that "no effects are visible" by actual observation "on the Gangetic and Central India plains"?

Another subject of investigation of yet more importance practically, is the value of the Jæderin base-measuring apparatus. After careful redetermination of the coefficients of expansion of the wires, the Dehra Dun base-line (the original length of which was determined with Colby compensation bars in 1835) was remeasured with the Jäderin apparatus. The mean result of two measurements is less than the original value determined in 1835 by $\frac{1}{206000}$ part of the total length (39,187·272 feet). Although this discrepancy is comparatively large (the discrepancy between each measurement of the Colby compensation bars with the mean value of four measurements averaging only about one four-millionth part of the total), it is expected that better results will be obtained. It is sufficiently obvious, however, that so long as the coefficients of expansion of the wires can be accurately ascertained, the Jäderin apparatus will furnish results which are amply good enough for all practical purposes short of principal triangulation, and its advantages may be thus summed up. Measurements can be carried out with ten times the rapidity, and with half the staff of observers, that are required by the Colby apparatus.

The immense amount of mapping turned out at Calcutta would astonish some of our reproducing agents in England. A specimen of the Vandyke process is given in the report, which certainly seems to secure all that can be desired as to sharpness and clearness in black-and-white reproduction.

It would be well if some of our great map-producing firms would turn their attention a little more closely to the periodic issues of the maps of India on the scales of 64 miles to the inch and 32 miles to the inch, and note therein the proper spelling of place-names, the disposition of boundaries, and the constant additions of new railways.

EXPEDITION TO THE NORTH MAGNETIC POLE.*

By Captain ROALD AMUNDSEN.

We shall be eight men all told. The vessel of the expedition is the ice-yacht *Gjöa*. This ship, which has already given on many occasions proofs of its solidity, has been still further strengthened by heavy bulkheads in the hold, ties between these, deck beams and keelson, and has been provided with a two-inch sheathing of planks as a protection against ice. The vessel is also fitted with a petroleum motor, by means of which it can make about 4 knots. The *Fram*, as far as I know, made 4½ to 5 knots. We take with us a supply of 27,000 litres (5940 gallons) of petroleum. Of this it is reckoned that 10,000 litres (2200 gallons) will be used for lighting, heating, and cooking. The remaining 170,000 litres (3740 gallon) will be sufficient to keep the motor going at full speed for 100 days, in which time a distance of 2400 nautical miles can be covered. The distance between Disco, on Greenland's west coast, and Bering Strait is about 700 nautical miles (15 miles to 1° of latitude) by the route I have chosen.

The *Gjöa* is 47 tons register, 70 feet long between uprights, and 20 feet broad. It may seem that the vessel is small, and, indeed, it is one of the smallest which has set out for a long polar expedition; but the choice was made after full consideration. Many will, perhaps, object that such a vessel cannot force its way through the ice, and that the space is too cramped both for the members of the expedition and for provisions. To this I reply that it has never been my intention to try and charge the ice with the *Gjöa*. My idea is to trust to patience, and steal through when there is an opportunity. The sounds and straits we must try to pass through in order to reach our goal are small and narrow, and for the most part full of drift-ice. The many attempts which have been made to force a way through them have all failed. Experience proves that to get through these waterways one must watch one's opportunity, and that is why a small vessel has the advantage, requiring less room, and therefore being easier to manœuvre. What, then, has not been accomplished with large vessels and main force, I will attempt with a small vessel and patience.

As for accommodation for the members of the expedition, it is not on a large scale, but good and comfortable, and there is still room left for stores and equipment.

We sail in the beginning of May, 1903, for Godhavn, on Disko island, off the west coast of Greenland, where, by permission received from the Danish Government, we can buy Eskimo dogs. From Godhavn a course will be set past Melville bay to Lancaster sound—the sound south of Jones sound, where the *Fram* lay during the last expedition. From Lancaster sound we turn southwards through Prince Regent's inlet to Bellot strait, between Boothia Felix on the south and North Somerset on the north. Magnetic observations will be taken as frequently as possible. Should the ice conditions be favourable, we shall continue our course through Bellot Strait and southwards along the west coast of Boothia. If the magnetic observations taken on the way indicate that we are then in the neighbourhood of the magnetic pole, two men will be put ashore with provisions for two years and the materials necessary for building a magnetic observatory and dwelling-house. My plan is to use packing-cases as material for the house, and these have therefore been made specially for the purpose, being all of grooved-and-tongued boards and of the same size. By filling these cases with earth, and placing them one above the other, walls may be speedily raised. A roof of grooved boards will be laid on the top. When the whole has been covered inside and out with roofing felt, and snow has been thrown over, quite a warm house will have been easily constructed. To avoid disturbances in the magnetic observations the cases are put together with copper nails.

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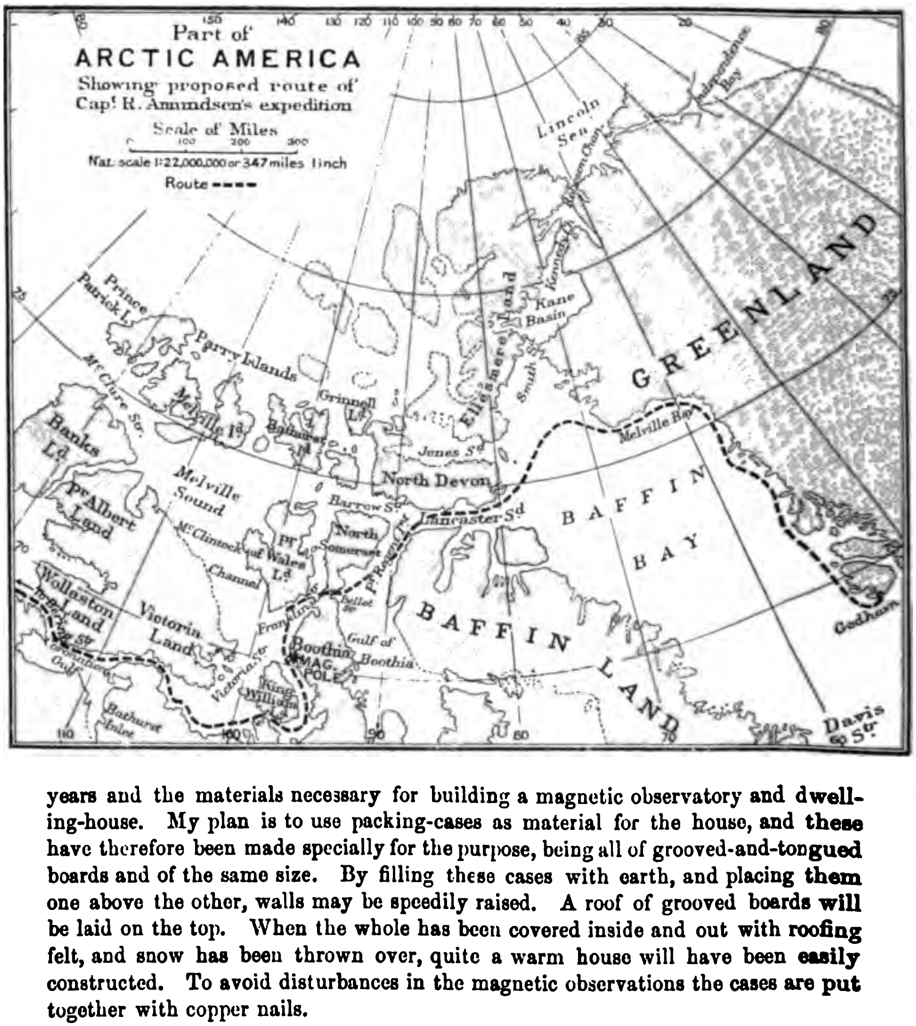
* In the *Journal* for April, 1902, details were given of Captain Amundsen's proposed expedition to the north magnetic pole. The arrangements are now all but complete, and the following further details are given by Captain Amundsen in the *Morgenblad*.



When the needful provisions and material have been brought to land, the two men will begin the observatory and the installation of the self-registering instruments, while the vessel pursues its way southwards to seek a wintering harbour on

King William Land. As soon as the vessel is in safety, I shall set out with a companion to open communication with the two men left behind on the coast of Boothia, in order to render them assistance in their preparations for winter. When everything has been put in order, I shall return with my companion to the ship. While the two men on Boothia Felix attend to the magnetic observations, we on board shall get ready for the coming spring.

At the first opportunity sledge expeditions in various directions will commence, and all possible scientific work will be executed. I shall, with an assistant, devote myself to magnetic observations, and seek to determine the position of the pole. By the end of autumn, 1904, this work will, I hope, be completed.

. After the spring expeditions the various sledge parties will meet at the ship, and on the breaking up of the ice we shall endeavour to carry the vessel westwards, and shall look out for a winter harbour on the south side of Victoria Land. The spring of 1905 will be spent in exploring the neighbouring land. In the autumn of 1905 I shall again try to communicate with the magnetic observatory on Boothia, in order to bring the instruments, etc., back to the ship. The direct distance between the south-eastern point of Victoria Land and Boothia is 40 nautical miles, and between the southern point of King William Land and Boothia 30 miles.

In the summer of 1906 we shall make again for the west in the vessel, and magnetic observations will be taken whenever an opportunity offers. Winter quarters will be sought—possibly at Herschel island. The winter and spring will be spent in various observations. At the break-up of the ice in the summer of 1907 we shall try to round the north-west point of America into Bering strait.

In a letter in the *Morgenblad* of November 9, Dr. Nansen speaks very hopefully of Captain Amundsen's prospects. He agrees that on the whole a small vessel is preferable, as it can make its way along the leads that open out between the drift-ice and the land. A small party can be more easily provided with fresh food than a large one, and Nansen affirms that had Franklin's expedition consisted of eight instead of 138 men, all would have returned safely to Europe. The plan of attempting the north-west passage fits in well with the main object of the expedition—the determination of the position of the north magnetic pole or polar area—and there are probably no insurmountable difficulties in the way. The worst tract is perhaps along the west coast of Boothia Felix, south of Bellot strait. The ice-conditions there may be unfavourable, but little is known about them. There is a strong tide, often running with a very rapid current, which probably breaks up the ice in summer. It fortunately happens that the region where a prolonged stay is necessary for the magnetic observations is just where obstacles to progress are most likely to occur. Of Captain Amundsen's personal qualifications for the work Dr. Nansen speaks very highly, and refers especially to the valuable observations he made in 1901 on the East Greenland current. It was at first Amundsen's intention to bear the whole cost of the expedition himself. His vessel was to set him and his party ashore in Hudson's bay, and then fish for whales to cover part of the expenses. Now that the expedition is planned purely for scientific objects, Amundsen is obliged to seek outside assistance, and funds are still wanted.

GEOLOGICAL REPORTS FROM SOUTH AFRICA.

By A. J. HERBERTSON, M.A., Ph.D.

CAPE COLONY.

The Reports of the Government Geologist for Cape Colony for 1898 and 1899 have recently been received, and contain records of work done in the south-west and between Hopetown and Prieska in the Orange valley. More than once the geologists have to complain that the lack of adequate topographical maps is greatly hindering their work. The western divisions have now been examined to Oudtshoorn and George, mainly the slates of the Malmesbury beds, which form low ground or valleys, and are associated with intrusive granite, and sheared conglomerate of uncertain ages, now called Cango conglomerate, at the foot of the Zwartebergen, dolomite limestone, a porphyroid, and many diabase dykes.

Geographically and geologically the Anysberg, Kleine Zwartebergen, and Groote Zwartebergen are one continuous chain of great folds of Table mountain sandstone. In the Anysberg it is a simple anticline rising up out of the Bokkeveld beds on north, south, and west. Farther east the rock is much more folded, and has the Bokkeveld beds faulted against it almost to the Gamka Poort. East of this great gorge across the mountains, each of the formations on the north of the chain, from the Ecca beds downwards to the Bokkeveld beds, dips successively under the one geologically above it, and in the Oudtshoorn district the Table mountain sandstone of the Zwartebergen has a southerly dip which brings it beneath the slate and conglomerates; this is probably the result of a great inversion.

Table mountain sandstone is found continually from Cape Hangklip northward beyond the Winterhoek mountains, and runs eastward in four anticlinal ridges of complex folds, which form (1) the rocky coast-line and adjacent mountains from Hangklip to Agulhas, (2) the Zondereinde range, (3) the Langebergen, and (4) the Zwartebergen. The Bokkeveld beds in the area surveyed (1) lie from Caledon to Mossel bay, and (2) north of the Langebergen. In the southern regions the farmers distinguish between the rough, irregular ridged "Ruggens" and the sand-dunes or limestone derived from them—" Duinen."

Lying unconformably above the Bokkeveld, Table mountain, or Malmesbury, and even older beds, is the Enon conglomerate, thick banks of conglomerate passing vertically and horizontally into coarse lenticular beds of sandstone. Here and there carbonized plant remains have been found, and some lignite is said to be used as fuel in the Oudtshoorn district.

Perhaps the most interesting of these reports is that for 1899, wherein a full discussion by Messrs. Rogers and Schwarz of their investigations of the conglomerates of the region between Prieska and Hopetown is preceded by an admirable summary, by the Director of the Survey, Dr. Corstorphine, of the papers on these now admittedly glacial conglomerates, known as the Dwyka beds in the Karroo, but also found in Natal and in the Transvaal. In the northern conglomerates of Cape Colony some parts are stratified, others are not. In the former boulders are rare, in the latter they abound in all sizes up to several feet in diameter, and in all shapes—angular, sub-angular and rounded, facetted, and in many cases striated. Most, but not all, of the boulders are of local origin, and are embedded in a finely fragmental matrix. The underlying felsites and other rocks form an irregular floor, which has obviously been carved into hills and valleys before the conglomerate was laid down over them; and here and there rounded, polished, and striated hummocks are found with the striation running in definite directions. Both polished and striated surfaces are best preserved where the overlying conglomerate has been most recently removed. Fossil evidence is lacking in the Prieska district, but abounds in the Transvaal, and Dr. Corstorphine has practically no hesitation in classing all these glacial conglomerates as of the same geological horizon as the Dwyka or Ecca conglomerates of the Southern Karroo. A remarkable difference between the northern glacial conglomerates and those of the Southern Karroo, is that there is an unconformity below and probably above the northern conglomerates, which lie over rocks older than the Witteberg beds, are rarely bedded, and are of varying petrographical character, but contain local boulders. The conglomerates of the Southern Karroo are separated from the underlying Witteberg beds by plant-bearing shales exactly the same as those between and above the actual conglomerate beds, which are distinctly bedded, of uniform petrographical character from Matjesfontein to Grahamstown, and contain many boulders of distant origin, some from rocks known in place in the north. From this, Dr. Corstorphine concludes that the northern glacial conglomerate was a ground-moraine resulting from prolonged glacial action on a northern land-surface in late Palæozoic times, and the Southern Karroo or "Dwyka" conglomerate, was probably formed under inland water into which there floated icebergs from the north carrying glacial *débris.*

NATAL.

We turn from Cape Colony to Natal, from which land the first report of the geological survey has just been issued by Mr. William Anderson, the Government geologist, and gives an account of his work in 1899–1900. A reconnaissance survey and map have been made of the coastal area and part of the inland region to the north. A more careful map of the Stanger district on a scale of 1 inch to 1 mile accompanies the present report. In the introduction preliminary notes are published on the lenticular beds of the coal-yielding districts, on the rock-shelters of the Drakensberg with their artistic drawings by Bushmen, on the sections in various railway cuttings and other observations made during a rapid journey over the colony. The present report has a useful sketch of the history of geological investigations in Natal, accompanied by a bibliography.

In Natal, Mr. Anderson finds that normally the Dwyka glacial conglomerate lies unconformably over the Palæozoic sandstones, and so is presumably of land origin, like the northern glacial drift of Cape Colony. It passes gradually into the fine-grained mudstones and carbonaceous shales of the Ecca beds, exactly similar to the series which occurs at Kimberley. The fossiliferous coal-bearing rocks overlie this shale on the north coast, and appear to have been formed of transported vegetation, as no root-marks are found.* In many localities in Natal where the Dwyka conglomerate has been recently removed, glacial striæ are well marked on the underlying rock, and Mr. Anderson gives a couple of excellent photographs of such scratched rocks. Polished and striated boulders are common in Kranzkop, Umvoti country, where the Dwyka conglomerate thins out, but are rare elsewhere.

The disintegration of almost universally distributed heavy basic volcanic rocks makes the otherwise poor soil fertile, and such is invariably the nature of the soil in the areas under tea and sugar along the coast.

As regards minerals, the Stanger district is not rich. Coal-beds belonging to the Ecca beds, although equivalents of the Zululand coal measures, and probably of the York and Estcourt series, have been found when struck to be useless for all practical purposes. Mr. Anderson thinks bauxite may be found.

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* *Cf.* in the Transvaal.

Zululand is divided into two distinct portions—the littoral, and the highlands or uplands. The flat or undulating littoral varies from 4 miles to over 20 miles at False bay, St. Lucia lagoon, and is bounded by sand-dunes on the east, and by the foothills of the uplands on the west. The sand in places is over 90 feet deep, and shows stratification and false bedding below the surface. It is often chocolate in colour, due to ferruginous matter derived from neighbouring volcanic rocks. The lagoons vary from small pans of intensely salt water to St. Lucia lake, 100 square miles in area. Springs of supersaturated salt water occur, and natives collect and use the salt deposited around them. Much of the littoral is marshy, and covered with thorny scrub, but no open forest. The streams have eroded steep and sometimes deep gullies across the undulating land, and along their courses are dense woods with thorny undergrowths. The fever tree, with yellowish green stems and branches, is a feature of the landscape in the north, and indiarubber occurs near and beyond the Portuguese boundary.

The coast south of the Umfolosi river has rocks, probably volcanic, below high-water mark, but north of it such rocks are rare, probably because the rocks are soft limestones, etc. The sand-dunes above high-water mark are persistent, and many rise to over 400 feet. Impenetrable prickly scrub covers their seaward base, and usually vegetation is found to their summits. Where the wind has kept the side clear, lenticular shell-deposits, with burnt ashes and broken bones and pottery, are found, the remains of kitchen middens still being formed by the natives, who are numerous on the littoral strip, and cultivate mealies on the more favoured patches. Many wrecks and no harbours characterize the coast, for the rivers are dammed by sand-bars, where they do not empty into lagoons. The whole coast of South-East Africa appears to be rising. The Mozambique current helps to form these sand-bars, but in the case of Delagoa bay, with its natural semi-circular breakwater, it scours the sand away.

Except in the undulating region between the Tugela and Eshowe, the uplands rise abruptly above the littoral. They are formed of coal-bearing rocks, dipping slightly eastwards with some old lava-flows, but more commonly intruded volcanic hills and dykes with crystalline rocks. Many precipitous gorges in which the rocks are exposed are formed by the rivers. Open pasturage characterizes this country, but large tracts are covered with thorny bush and isolated patches with timber. The rugged, barren Lebombo mountains, of a very siliceous rhyolitic rock, rise abruptly above plains both on east and west, the latter broken by razor-backed hills capped with quartz.*

THE TRANSVAAL.

The Transvaal Government have just published a translation of the report of the State geologist, Dr. Molengraaff, for 1898.† A more complete and systematic account of the geology of the Transvaal from the pen of the same author has been issued by the French Geological Society, and is accompanied by a well-printed map.* The following notes are taken mainly from the latter publication.

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* The last three paragraphs are condensed from the report.

† 'Geological Survey of the South African Republic. Annual Report for the Year 1898.' By Dr. G. A. F. Molengraaff. Government Printing Works, Pretoria. 1902.

Dr. Molengraaff recognizes three geological systems in the Transvaal, with subdivisions which are shown in the accompanying table:—

RECENT.			
III. KARROO SYSTEM	Upper Karroo	Highveld Formation (Molteno beds?) Beaufort series — — — — — — — — †	Fluviatile and Lacustrine.
	Lower Karroo	Ecca beds Dwyka Conglomerate — — — — — — — — †	Glacial.
II. CAPE SYSTEM		Waterberg Sandstone (?). Bushveld Plutonic series (Red Granite, etc.) Pretoria series (cf. Wittebergen of Cape). Dolomite series (cf. Bokkeveld of Cape). Black Reef series (cf. Table Mountain Sandstones). — — — — — — — — †	
I. SOUTH AFRICAN PRIMARY SYSTEM		Witwatersrand series. Barberton series. Old Granite and Schists.	

† — — — — — — means unconformable. The unconformity between Ecca and Beaufort beds is slight. The position of the Waterberg Sandstone and of the Bushveld amygdaloid series is more or less uncertain; the former probably occupies a distinctive position between the Cape and Karroo systems.

The Primary System of South Africa is considered by Dr. Molengraaff to be a single formation of pre-Devonian age, which practical considerations lead him to divide as above. Two series of sedimentary rocks can be observed, clastic rocks and crystalline schists, but differences are due to different degrees of a profound metamorphism which has been brought about by intrusions of granite. Near Barberton the strata are much folded and dip almost vertically. Gold is widely distributed, but is not associated with any special level or rock, although it seems related to orogenic disturbances. Similar conditions prevail in the Murchison range, Zoutspansberg, Rhodesia, Portuguese Manikaland, and also in Hospital Hill, near Johannesberg, where they are of no economic value. The most important beds of the Primary system, from the economic point of view, are the Witwatersrand gold conglomerates—the Banket—found on the Rand, at Heidelberg, Vredeport (Vaal Gold Mines), Klerksdorp, and Vryheid. Other minerals of economic importance exist in these Primary rocks, *e.g.* cinnabar in a sericitic schist in the Lomati valley; antimonite in the amphibolites near Forbes Reef in Swaziland, north of Steynsdorp near the Komati, and in the Gravelotte mine near Leydsdorp; copper ores south of Vryheid; while many gold-mines are rich in iron and copper ores, as at Vryheid, Barberton, and Steynsdorp.

The Cape System is much less disturbed than that which it overlies, and while the layers are not uniformly horizontal, they are never more strongly folded than into gentle undulations whose dip is invariably less than that of older strata.

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* 'Géologie de la République Sud-Africaine du Transvaal.' Par le Dr. G. A. F. Molengraaff. Bulletin de la Société Géologique de France. 4^{e} Série I., pp. 13-92. 1901. Map, scale 1 : 1,500,000, sections and figures.

The Black Reef series, which stratigraphically closely resembles the Table Mountain sandstones, although no palæontological evidence of uniformity of age has yet been discovered, varies in thickness from under 40 metres in the south to over 500 metres in the north. It consists of dark quartzites, clays, sandstones, slates, greywackes, and auriferous conglomerates, and usually forms a low wooded escarpment. The auriferous conglomerates are exploited south of Klipriviersberg, near Klerksdorp, and at Duivels-Kantor, in the Lydenburg district; but the results are not satisfactory, as the gold is very unevenly distributed in shoots. In the Lydenburg district, in the locally named Drakensberg sandstones, is an auriferous and ferruginous quartz reef (Sherwell reef). The Kromdraai slates, which form a constant horizon over great areas, contain an auriferous vein with pyrites and arsenopyrites.

The *Dolomite series* lies concordantly above the Black Reef beds, and consists of dark blue or black dolomite or dolomitic limestone from 10 centimetres to 3 metres thick, alternating with more or less resistant bands of flint, which are thickest on the top. The softer limestone is rapidly weathered, Karst forms are common, and when horizontal and capped with flint, characteristic escarpments and caves are formed. When dipping steeply, denudation is very rapid. This series or rocks plays a most important economic *rôle*, for it is a porous water-reservoir which supplies all the streams of the western Transvaal—the Mooi, Harts, Marico, &c. Gold-bearing layers are found at the base and at the summit in the Lydenburg district, in the Tweefontein slates persistent metallic veins with pyrites, manganese, and gold occur, and lead exists in pockets in the Marico district to the south of Pretoria.

The *Pretoria series* is formed of a succession of slates, argilites, quartzites, and intercalated beds of diabase. The resistant quartzites crown many a *kranz*, whose steep escarpment can be traced for great distances. The southern scarp of the Magaliesberg rises practically vertically to about 1600 metres above the sea for some hundreds of kilometres, a second line of heights is the Daspoort (Witwatersberg of Jeppe), and a third the Timeball range, near Pretoria. The rocks dip to the north at angles from 25° to 40°, and the southern is the steep-scarped slope. The thickness of the series is estimated at 2600 metres. The rocks become more and more ferruginous west of Pretoria, but nowhere are they rich in minerals. Auriferous quartz veins occur near the base, recalling those of the Dolomite, and this has been successfully exploited at Frankfort in the Lydenburg district, but not elsewhere. Veins with silver, lead, and copper ores have been discovered near the top of the series near Pretoria. These veins are all related to the Bushveld Amygdaloid series.

Dr. Molengraaff gives the name *Bushveld Amygdaloid* or *Plutonic series* to the red granite of the Bushveld, which is very different in constitution and age from the grey old granite of the Primary series, and to the magnetite, norite, and the porphyritic rocks of the Zwagershoek. These rocks were erupted and intruded after the formation of the Pretoria beds and before those of the Karroo system, and it is probable that the well-known crater-like salt-pan to the north of Pretoria is one of the eruptive centres. The magnetite at the base is the best iron ore in the state, and is found in a belt along the north side of the Zwartkoppies and the Pyramids, in the Blood river-valley, and at the foot of Bothasberg, in the Middelburg district. Chrome iron ore is also found in decomposed norite and gabbro.

The Waterberg Sandstone lies horizontally or in gentle undulations corresponding with those of the underlying granite, being turned up where the granite forms hills.

It is composed of reddish-white and dark-red sandstone, breccia, and conglomerate. It was formerly supposed that a banket similar to that of the Rand existed, but only slight traces of gold have been found in the Waterberg banket. Specular iron, of no economic value, is found in the dykes in the sandstone, and fluorspar is associated with it at Welgevonden farm. The age of this series of rocks is doubtful, but Dr. Molengraaff is inclined to look upon it as concordantly deposited above the Pretoria series, and raised up to form the roof of a red granite laccolith.

The Karroo System lies discordantly above the preceding rocks, and its strata are in general horizontal.

The Lower Karroo rocks, to a certain extent, preserve the undulations of the surface which they overlie. They consist of the Dwyka conglomerate and the Ecca beds. Dr. Molengraaff sums up his conclusions about these formations as follows: "The non-stratified Dwyka conglomerate must be looked upon as a true ground moraine, the boulder clay of a gigantic glacier or ice-sheet of Permian age; and the stratified Dwyka represents the bedded glacial deposits laid down in water underneath or in front of the ice. The Ecca beds represent the deposits of the glacial torrents and sediments of the glacial lakes of the morainic area, mainly during the melting and retreat of the glacier or ice-sheet, and thus are similar in origin to the diluvial loess of Europe, abstraction being made of subsequent modifications." The glaciation probably was prolonged and extensive, for over 400 metres of Dwyka conglomerate have to be accounted for in Cape Colony. The Dwyka conglomerate is almost impervious to and absorbs little water, and weathers tardily. It forms an arid infertile soil in dry districts, but a rich one in wet districts. It contains no minerals of economic importance, although here and there boulders of auriferous quartz may be found, and even these are wanting in the Ecca shales. When the boulders are removed, the binding cement is used for making very resistant bricks near Vereeniging.

The Upper Karroo Beds do not undulate as the lower ones do. The Beaufort series consist of bluish sandstones which weather yellow, and form distinct *kranzes* along the mountain slopes. While abundant plant remains occur in thin thready veins, no coal of any importance has been found. The Stormberg series is represented in the Transvaal by the High Veld formation, the equivalent of the Molteno beds—the lowest part of the series of the Cape. It consists of sandstone, sandy shale, shale, carbonaceous shale, and coal. It is whiter than the Beaufort beds, and is permeated by a fairly strong cement rich in kaolin. It occurs only in the most elevated regions, and in many places a thick sheet of diabase is found at its base (*e.g.* in the Doembe mountains), and other sheets exist at higher levels and form remarkable *kranzes* (Pongolo forest, Makateeskop in the Doembe mountains). The most important layers in the High Veld formation are the coal-beds, which unfortunately yield a rather poor-burning, non-coking mineral, and occasionally contain so much sulphur as to be dangerous. The deposits, however, are immense, and are found in horizons varying from 1200 to 1800 metres above the sea. They seem to consist of vegetable alluvium deposited by torrents, and so resemble in origin the coal fields of Central France. They should supply South Africa with fuel for at least a century.

Since the formation of these Karroo beds the Transvaal has been subjected to denudation, but recent deposits are met with only here and there—such as alluvium, limonite, eolian deposits, calcareous tuffs, which are of no more than of local importance. The diamentiferous eruptive rocks of the Orange River colony, however, are more recent than the Karroo system, and round Reitfontein, 17 miles east of Pretoria, diamentiferous pipes have recently been discovered.

Distribution.—The Transvaal consists of a high and a low tableland. The Low

Veld stretches from north to south, is fairly uniform in width, and is composed of ancient granites and schists of the Primary system, which also seem to extend up the Limpopo valley. In the extreme east the Low Veld is traversed by a fault, which has lowered these rocks at least 1500 metres on the east, and brought them in contact with a narrow belt of the High Veld series, east of which rises an equally remarkable belt of eruptic rocks covering the High Veld rocks, and forming the Lebombo mountains. This is the eastern margin of the African tableland. On the west of the Low Veld the Drakensberg escarpment rises, and the higher tableland is covered with the High Veld formation in the south, and with the Black Reef, Dolomite, and Pretoria rocks in the north. The same rocks occur in reversed order—Pretoria Beds, Dolomites, High Veld series—on the western margin of the colony, and the map indicates their occurrence in the north and in the south, as if they formed the margins of a vast basin filled with the Red Granite and Amygdaloid rocks of the Bush veld. Both the northern and southern rims, however, are not continuous in their curvings, but bulge out to surround minor basins. In the north this basin is not merely filled with plutonic rocks, but these are capped with the Waterberg sandstone of the Palala plateau. In the south the structure is more complicated, and a semicircular trough covered with Pretoria beds is surrounded by four bosses in which the old granite, Barberton, and other Primary rocks appear. These four bosses lie (*a*) north of Klerksdorp, (*b*) round Vredefort, (*c*) east of Heidelberg, and (*d*) north of Johannesberg. As has been already mentioned, the south-eastern rim of the great Bushveld basin is hidden under the more recent High Veld rocks.

THE RECENT VOLCANIC ERUPTIONS.

The record of volcanic and seismical events during the month is, happily, almost blank. With the exception of an eruption of the volcano of Santa Maria in Guatemala, about the extent of which the reports are very conflicting, no serious disturbance has as yet been reported in any part of the world since the eruption of the St. Vincent Soufrière on October 16.

The literature dealing with the recent events has, however, received some important additions. In the *Comptes Rendus* for September 1 (t. cxxxv. No. 9), MM. A. Lacroix, Rollet de l'Isle, and Giraud, publish a preliminary account of their official investigations in Martinique, which extended from June 20 to August 1, with the exception of three days spent at Guadeloupe. The report is extremely suggestive throughout, and throws light on some points which seem to have been omitted by most other observers. The crater of Mont Pelée was approached from three sides, each time with difficulty and no little danger, and it was found that, while the old summit was not actually destroyed, certain modifications have taken place near the crater. No great fissure has opened outside the crater, but the occurrence of fractures along definite lines is indicated by numerous fumaroles, running generally in a north-east to south-westerly direction. The majority of these fumaroles are within a narrow zone between the beds of the Rivière Sèche and the Rivière Blanche; and apparently another line along the coast, between the Rivière Sèche and the stream at Canonville, forms a secondary series cutting the first. It has been ascertained that the fumaroles of the Rivière Blanche are not confined to the land, but that they continue under the sea; and it is remarkable that it is in the direct line of their prolongation that the submarine cables were broken 10 miles from the coast on May 5 and 30 and July 8. When the cable broken on May 30 was brought to the surface (on June 11), the tar covering it was hanging in drops, although the depth is 1200 fathoms. On May 5, before the catastrophe at the Usine Guérin (the date of the appearance of the fumaroles in the valley of the Rivière Blanche), large numbers of dead fish were taken from the surface in the same direction.

Speaking generally, the phenomena of volcanic eruptions present two main features: (1) the explosive ejection of gas, vapour, and siliceous materials in either solid or melted state; and (2) the issue of the same silicates in the melted state in the form of streams or masses. Up to the present the eruptions in Martinique have been exclusively of the first kind; the issuing streams so variously described have all consisted of torrents of hot muddy water, capable of transporting large blocks of rock. The eruptions of gases and vapour from the crater of Mont Pelée present no unusual features; only at the opening to the south-west were any abnormal appearances observed—surges of thick, heavy vapour of a dark, sometimes coppery colour rolled over the talus slopes of the crater to the bottom of the crevasses leading into the Rivière Blanche. The only facts definitely ascertained as to the composition of the gases issuing along with the water-vapour is the relative abundance of sulphurous acid, apparent from its suffocating smell; but even this was only unmistakably evident when the mountain ridges were approached.

The fumaroles being more accessible than the volcano itself, it was possible to study them more fully. Their general distribution has been already described. Sometimes they occur in the actual beds of the Rivière Blanche and Rivière Sèche, especially near the mouths, but most of them are dotted about, either singly or in groups, without apparent order. The fumaroles examined behaved differently according as they found vent in the open air or in the bed of the stream. Those which reached the surface in the volcanic conglomerates, amongst the ashes, or in the fissures in the old soil, gave forth but little steam; often no steam was apparent, but it could be detected by holding a piece of cloth over the orifice. The temperature of these fumaroles oscillated about 100° C.; they contained a great deal of sulphuretted hydrogen, and deposits of sulphur formed round the openings. Other fumaroles associated with them were much hotter, the temperature one decimetre below the surface being almost 400° C.—melting lead easily, but not zinc. These fumaroles gave abundant deposits of sal ammoniac, a little sulphur, and rarely realgar. The sulphur fumaroles extend quite to the sea, but are specially numerous between the Rivière Blanche and the Rivière Sèche, halfway between the crater and the coast. No sal-ammoniac fumaroles were observed within 800 metres of the coast; they became abundant in the upper valley of the Rivière Blanche. Both types had feeble ascensional force, and neither was intermittent.

A different type of fumarole was observed in action in the end of June and the beginning of July, in the beds of the Rivière Sèche and the Rivière Blanche, particularly at their mouths, and near the mouths of other rivers. These were much more vigorous, sending out at intervals large dense clouds of white steam, which ascended to a height, rolled out into volutes, and descended again to the surface of the ground or the sea. The action of these intermittent fumaroles had no apparent direct relation to that of the crater. During the week preceding the eruption of July 9 the fumaroles near the coast greatly diminished in intensity.

The outbursts of black muddy water so frequently mentioned in accounts of the Martinique eruptions, were minutely studied, and will doubtless be fully dealt with in the detailed report. The immense variations in temperature of the waters of the rivers are attributed to their action, and to the action of the fumaroles. In the Rivière Blanche a temperature of 69° C. was observed, and, at the same spot, some hours later, of 35° C.; and again the thermometer gave 84° C. at a mud spring 2½ kilometres from the coast, with 34° C. above, and 65° C. below.

Summing up, the French *savants* state that, except for the huge deposits of mud in the valleys of the rivers, and the stripping of vegetation from the surface, the topography of the land has suffered little change; and soundings at sea indicate no material changes in depth.

A further short note on the petrography of the rocks ejected by Mont Pelée, by M. Lacroix, appears in the *Comptes Rendus* for September 15 (t. cxxxv. No. 11).

In the Bulletin of the American Museum of Natural History (Article xxvi. vol. xvi.), Mr. Edmund O. Hovey publishes his official report on the eruptions of Martinique and St. Vincent. Mr. Hovey sailed on the *Dixie* with Messrs. Hill and Russell, and many of his points are to be found in the articles in the Martinique number of the *National Geographic Magazine*, already noticed. Some of the plates accompanying Mr. Hovey's paper are of great interest and beauty.

Prof. Heilprin contributes a short descriptive article on "Mont Pelée in its Might" to the September number of the *Fortnightly Review*. Prof. Heilprin and Mr. Leadbeater were the first to reach the top of the mountain. With reference to the valley of the Rivière Blanche, Prof. Heilprin notes that "the general surface smelled of mineral oil or steamed rubber, the significant odour which we had already noticed over the heated floor of the Lac des Palmistes on the top of the mountain." Speaking of the cloud which destroyed St. Pierre, he says, "What the exact constitution of this death-dealing cloud was will perhaps never be known, but its associations with the mud discharges, its heavy specific gravity, and the nephitic or oily odour of the products emitted by both the lower and upper craters, lend reasonable certainty to the belief that this glowing cloud was mainly composed of one of the heavier carbon gases brought under pressure to a condition of extreme incandescence, and whose liberation and contact with the oxygen of the atmosphere, assisted by electric discharges, wrought the explosion or series of explosions that developed the catastrophe. The preponderance of the heavy carbon gases in nearly all mud volcanoes supports this view, which is also strengthened by the absence, except in small quantities, of chlorine salts, to indicate the existence of a chlorinated gas."

Some interesting details of the later eruptions of Mont Pelée (August 17 to September 3) are to be found in a letter from Mr. H. A. Alfred Nicholls, published in *Nature* for October 23.

REVIEWS.

EUROPE.

THE ALPS IN 1864.*

UNDER the above title the late Mr. A. W. Moore printed, for distribution among his friends, a limited number of copies—less than a hundred—of his holiday Journal. The work has always been greatly prized by collectors of Alpine libraries. The difficulty in obtaining a copy formed a natural attraction to the collector; but apart from its rarity, the Journal was coveted as a book of rare charm. The most valued treasures of a library are not always the most read, but it is safe to say that Moore's Journal was never counted among the books at once sought after and neglected. It was but the simple, unaffected, straightforward account of a mountaineering holiday, written by a man who was in absolute sympathy with his subject, and knew thoroughly what he was talking about, and written with no thought either of the publisher or of the public. In such work, better perhaps than in any other, a writer unconsciously depicts his own personality, and sets down his impressions the more vividly because in a wholly unstudied manner. In the preface to the original issue the author apologizes for leaving in the text unimportant details and trivial incidents such as in a mountaineering journey "form the staple of a tour and constitute its charm." Revision could only have spoilt a work whose charm lies in its directness. This fact, we are glad to notice, is fully appreciated by the editor of the present edition. Many notes have been added, but these elucidate without interfering with the text. Often, indeed, the notes emphasize strongly the accuracy of Moore's judgment and observation, though it must be confessed they falsify in not a few instances his views as to the accessibility of certain Swiss mountains, and the possibility of traversing certain ridges which have since come to be termed "passes." Moore lived long enough to recognize that his judgment as to what could be climbed was often at fault. But in his day the mountaineer was an explorer rather than an athlete. The maps which the earlier generation of Alpine mountaineers had at their disposal, though good, were vastly inferior to the superb sheets now issued by the Swiss Government—unquestionably the most perfect delineation of a mountainous region to be found in any country. It says much for Moore's remarkable topographical accuracy of observation that many of the unnamed points of which he makes mention are clearly identified and noted in the present edition. Read a first time, any one of the accounts of the ascent of a peak or the crossing of a pass interests as a vivid direct narrative of mountain adventure. Read a second time, the description is felt to be the work of a man possessed of the keenest topographical insight, who can not only observe as he climbs, but apply his observation, and who yet all the time is thoroughly enjoying himself. Moore climbed in the spirit of a modern Conrad Gesner, with a simplicity of outfit and with a disregard generally of luxury that, while it forms a strong contrast to latter-day methods, explains how it came about that he accomplished so much.

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* 'The Alps in 1864.' A Private Journal by A. W. Moore. Edited by A. B. W. Kennedy, LL.D., F.R.S. Edinburgh: David Douglas. 1902.

It has long been felt—save perhaps by the fortunate possessors of original copies—that such a work as Moore's would interest a far wider circle than that for which it was primarily intended. Dr. Kennedy has carried out his labour of love, in preparing the new edition, with admirable judgment, and has succeeded, perfectly, in producing a volume that, while preserving faithfully the spirit of the Journal, throws into stronger relief its more hidden qualities of excellence. The familiar title is unchanged, although the editor has included in this volume—thereby enhancing its value—a good deal of matter from Moore's later journals.

The photographs illustrating the work are numerous and good, some of them admirable. Dr. Kennedy is responsible for many of the views, and fully holds his own as a photographer. The pictures have been selected as real illustrations of the expeditions described. The views are well reproduced, and not, we are glad to see, on abnormally heavy paper. Dr. Kennedy has indeed succeeded in producing a delightful compromise between an *edition de luxe* and a handy volume.

The scope of the work precluded, of course, mention of Moore's Caucasian explorations. It was in the Caucasus that he showed best his geographical acumen. In the expeditions made in 1868 and 1874, the party had to work with the old 5-verst map of the Russian Survey. No map, as regards the snow and glacier regions, could well have been more misleading. To Moore must ever be given the credit of being one of the pioneers who began to unravel the tangled errors of the glacier delineation of the Caucasian range, and to make clear the intricacies of this beautiful mountain region.

C. T. D.

ASIA.

TIBET.*

The geographical fascination which envelops the city of Lhasa is derived, like that of the north pole, from the inaccessibility of its position. For more than half a century no European has visited the city, and our knowledge of it is chiefly derived from the descriptions of natives of India, who have been trained as explorers by the Survey Department, and who have given us fairly ample details of the physical characteristics of the city and of its surroundings, but who have hardly possessed the education necessary to add much else that was of real scientific or literary value.

The little book now published by Murray is therefore of exceptional interest, for its author is a well-educated Hindu gentleman of great literary ability, and at the same time gifted with sufficient spirit of enterprise and adventure to carry him through perils and hardships in search for information such as would prove absolutely destructive to similar aspirations on the part of the great mass of his countrymen. Sarat Chandra Das is a member of the Educational Department of India, and he had already contributed a large number of valuable papers on the history, religion, ethnography, and folk-lore of Tibet to the Bengal Asiatic Society as the result of a previous visit to the grand monastery of Tashi Lhunpo (in 1879) before he undertook the journey of which this book is the result. He had even founded a society called the Buddhist Text Society of India, of which he is still the secretary.

Added to the quality of exceptional competency in its authorship, the book claims the immense advantage of annotations by an editor who is a well-known Tibetan traveller—Mr. W. W. Rockhill; so that it may fairly be quoted as the best and most accurate authority on Southern Tibet and its capital that has appeared of late years. This latest journey of Sarat Chandra Das was undertaken in 1881–82, so that there has been considerable delay in the reproduction of the record. Until 1890 the documents from which it is compiled were kept strictly confidential by the Government of India, when certain selections from them appeared in English magazines, and these form the basis of the present volume. Meanwhile, the number of valuable papers which have been published by the author as the result of his researches in the great libraries of Tibet is so great, that the bare enumeration of them would occupy "several pages." In his geographical inquiries he was assisted by the lama Ugyen-gyatso, who had been well trained as a transfrontier explorer in Darjiling. The actual story of their travelling adventures is told with all a Bengal's appreciation of the difficulties and risks (which were not inconsiderable) of the road, but with a great want of appreciation of anything approaching sentiment. We do not *see* Tibet as we follow the daily footsteps of the two travellers from monastery to monastery. The solemn grandeur of the Eastern Himalayas; the silent splendour of eternal snows; the magnificent sweep of still blue lakes embraced by demon-haunted crags and cliffs; and the shimmer and glitter of the morning sun on gilded spire of dome and chorten over the lazy, priest-ridden city were all there, but they did not appeal to an educated babu intent on unearthing material for a Tibetan-English dictionary with a Sanskrit-English appendix of Buddhist terms. Ugyen-gyatso had much more romance in his composition, but his is another (and a most interesting) story. Some of the illustrations are quaint and instructive (*e.g.* Cho-Khang, the grand temple of Buddha at Lhasa, and the photograph of Potala), but it is doubtful whether the photographic representation of Tibetan ceremonies could have been derived from the real original actors in the scene. Photographs under such circumstances would hardly have been possible. We probably owe it to the author's intimate knowledge of the make-up of Tibetan accessories that these representations are so exceedingly effective.

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* 'Journey to Lhasa and Central Tibet.' By Sarat Chandra Das, C.I.E. Published by J. Murray for the Royal Geographical Society.

T. H. H.

THE NEARER EAST.*

The delay in reviewing this important book in the pages of the *Geographical Journal* is not due to the editor, but to the reviewer. His chief excuse is that Mr. Hogarth has managed to condense into a volume of 255 pages an amount of solid material out of which he might easily have made a much larger book, so that it is necessary to read his work with considerable care in order to master the detailed information it contains. This task is, unfortunately, not rendered less difficult by the fact that the maps, as compared with the letterpress, are most inadequate in respect to the information which they give; and the ordinary reader, who has not the map-room of the Geographical Society at his immediate disposal, seeks in vain to find, either in the maps in this volume or in ordinary atlases, many of the names which Mr. Hogarth mentions. This is a defect which should certainly be remedied in a second edition. As it is, the reader studies many chapters with something approaching despair. He feels that the information given is important and worth mastering, and yet he is unable to master it because he cannot locate the positions of the places mentioned. In other respects the maps are excellent for their purpose. The coloured orographical maps are really works of art. The only practical defect noticeable in them is that the colouring of the highest contours is not sufficiently distinct from that of the lakes. Some of the sketch-maps are well designed for the purpose of displaying at a glance the main physical characteristics of a region—for example, those of Asia Minor on p. 30, Armenia on p. 40, and Syria on p. 65. There is one more serious defect to be noted and corrected in the volume before us. By some strange oversight, pp. 126, 127 have been printed on the back of pp. 141, 144 respectively. Pp. 126, 127 can also be found in their proper place, but pp. 142, 143 seem to have been omitted altogether from the volume.

There is nothing exactly like this book existent in English literature. It is geography in a new form, written by a man of well-known literary capacity. It deals with interesting regions which are often most inadequately treated in geographical text-books. Geographical text-books, too, are not, as a rule, bright examples of pure literature, and their authors are usually compilers of information gathered from the works of others. In this book, on the other hand, we have a large mass of first-hand information, especially with regard to Asia Minor, from a traveller and author who has done almost as much as any man living to let in light upon this dark corner of the world. But Mr. Hogarth has also studied the works of others in very thorough fashion, and has presented the results of that study so graphically that he is hardly less interesting in his descriptions of Arabia and Persia than in those of lands of which he has personal knowledge.

The book is a good book. It is not merely interesting and instructive to the geographical student, but is equally so to any educated reader who wishes to get a real knowledge of a region of the world which has in the past played a great part in civilization and history, and may, perhaps must, in the near future become the theatre of events of world-wide moment. It is a region of strange and startling contrasts, which are well brought out by a writer who can paint with a broad brush.

The reader may not always agree with Mr. Hogarth's general statements, because he demolishes so many accepted facts. There are some instances in which his zeal as an iconoclast has carried him somewhat—perhaps we may say, too—far. For instance, his view of the comparative ineffectiveness of the barrier of Taurus is very difficult to reconcile with the statements of other travellers with regard to the nature of this chain, and still more difficult to reconcile with historical data extending through many centuries. But perhaps Mr. Hogarth may be excused if he is somewhat severe in his treatment of some of the cherished beliefs of his countrymen whether on the past or the present. The justification is to be found in the most interesting chapters which he has written upon life under Eastern conditions, which contain so much that is at variance with those accounts of the peoples of the East which we have received from travellers who have spent a few days at Athens, a few hours at Smyrna, maybe, and a day or two at Constantinople. After reading what Mr. Hogarth has to tell us, we feel that even the unspeakable Turk becomes—speakable; that he is in some respects as good as ourselves, in some respects a little better.

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* 'The Nearer East.' By D. G. Hogarth. London: W. Heinemann. 1902.

Aristotle says that a statesman ought to have knowledge of the parts of the soul. On this principle we commend this book to the British politician. It will tell him much of the soul of those peoples of the Near East. The Englishman can here buy his knowledge cheaply, for seven shillings and sixpence, instead of resorting to that market where he usually purchases the correction of his own ignorance—the market of war.

If the remaining volumes of this series attain to the level of the one before us, its issue will mark a most important advance in the standard of geographical literature.

G. B. GRUNDY.

AFRICA.

EASTERN EQUATORIAL AFRICA.*

One can hardly feel surprise, on reading this latest story of African exploration, that the region with which it has to do has been one of the last strongholds of the unknown to fall before the attack of latter-day explorers. Few areas in the whole continent can present greater difficulties to the pioneer than are met with in the tract of country between the Nile and Lake Rudolf, in the opening up of which Major Austin has played so conspicuous a part. The most opposite extremes here combine to put obstacles in the traveller's way. He is hampered alike by swamps and deserts; by torrential rains and burning sun; at one time by the attacks of treacherous natives, and at another by the entire absence of inhabitants. A thrilling interest cannot, therefore, fail to be felt in the story of the fight with these obstacles, brought to a successful issue solely through the indomitable pluck of the author and his two companions, who, in carrying through their task, were called upon to endure hardships hardly surpassed in the history of exploration.

Major Austin's narrative gives a plain, straightforward account of his two expeditions to the region of the Sobat and Lake Rudolf, no attempt being made to exaggerate the hardships encountered, but rather to tone them down in consideration for the feelings of his readers. The first of the two journeys, though free from the more harrowing experiences of the second, had certainly its full share of difficulties. The monotonous Sobat plains, with their swamps and interlacing waterways, presented obstacles enough during the outward journey, but they were rendered doubly serious on the return, when the advent of the rains made it difficult at times to find a dry spot on which to camp. The ascent by the gorge of the Baro to the Abyssinian plateau involved hardly less difficulties, while Major Austin, like other travellers, was prostrated by the sudden change to the bracing air of the mountains. Some reward was found in the hospitable reception by the Abyssinians, whose semi-civilization offered a marked contrast to the naked savagery of the Sobat plains. Of the dwellers in the latter, the Nuers are described as uninteresting bullies, while the Anuaks are peaceful, friendly, and industrious, and raise splendid crops twice a year from the generous soil. Though not so tall as the Nuers, they are finely developed, though leprosy occurs among them, probably owing to the fish diet to which they are largely addicted.

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* 'Among Swamps and Giants in Equatorial Africa.' By Major H. H. Austin. London: Pearson. 1902.

The second and more important of the two journeys led equally through the Anuak country, where travelling was rendered trying by the long grass which had now sprung up, while mosquitoes made life a burden. The natives, too, showed much timidity, and it was difficult to come in touch with them. But the march was broken by some more agreeable interludes, for we read of pleasant groves enlivened by birds and butterflies, varied landscapes of hill and dale, and well-wooded heights with bracing climate. The Abyssinian escarpment was frequently visible to the east, sometimes rising to a height of 8000 feet above sea-level, and forming unbroken precipices of solid rock. Hereabouts the rainfall seemed to be very great; but this well-watered zone gave place in a surprisingly short space to burnt-up plains in which not a drop of water was to be obtained, and this again to a new tract of swamp near the head of Lake Rudolf. But it was only on reaching the Omo and finding it impossible to obtain the hoped-for supplies, that the final blow was struck which made the rest of the expedition one long fight against hunger, disease, and ill luck of every imaginable description. Major Austin's simple but graphic narrative brings out forcibly the extraordinary difficulties involved in a march through the African bush without guides, and often without the vestige of a path. From the time the Anuak country was left until the arrival at Lake Baringo it was impossible to communicate with the natives except by signs, while during the march through the Turkana country the caravan was constantly dogged by treacherous giants, who speared unwary stragglers. It is needless to enter into the harrowing details of this part of the journey; suffice it to say that but for the wonderful memory for topography displayed by the leader, who, though suffering from a virulent form of that dread disease, scurvy, guided his party unerringly by the recollection of his former visit to this region, it can hardly be doubted that not one of the harassed band would have reached the friendly succour of the British post near Lake Baringo, to which but seventeen, out of a total of sixty-two, finally made their way.

Major Austin's narrative is interspersed with items of interest which help to relieve its more sombre side. Thus we are told how the donkeys, having by dint of shoving, hauling, and vituperations, been once got safely across the Akobo, subsequently gave their masters credit for some amount of judgment, and readily crossed in future. How others, captured from the Turkana, showed so much clannishness that they resolutely refused to mix with the rest. How the camels, accustomed to the thorn vegetation of the north, would rather starve than touch the low scrub on which the Turkana camels waxed fat. How one of these animals that had fallen into a pit maintained perfect equanimity until accidentally discovered, but resented the attempts to haul it out. The fatal effects of a meat diet on men accustomed to vegetable food are strikingly brought out, as are also the effects of discipline, which enabled the Sudanese soldiers to behave like men, while their kinsmen, the ex-Dervishes, had sunk to the level of vultures. We learn, too, of the extraordinary changes to which both country and people are subject in this part of Africa, large settlements vanishing completely and leaving not even the memory of a name. In spite of the difficulty of maintaining intercourse with the people, a considerable amount of information is given respecting the various tribes, especially the Turkana and Suk, the photographs also giving a good idea of their physical appearance. The paper and printing of the book are both good, but it is unfortunate that the illustrations are mostly scattered at haphazard through the text without any regard to order.

AMERICA.

THE ANDES.

In this book Sir Martin Conway* gives an account of his ascent of Aconcagua in the footsteps of the members of Mr. Fitzgerald's expedition, and of his exploration of Mount Sarmiento in the Straits of Magellan. He also visited those very remarkable inland basins named by their surveyors Otway and Skyring waters. The narrative is interesting throughout and well illustrated; but perhaps the most useful part is contained in the account of the progress of sheep-farming on the pampas between Punta Arenas and the Argentine frontier.

Over two years ago Prof. Ray Lancaster said, in a lecture before the Zoological Society, "It is quite possible—I don't want to say more than that—that the mylodon still exists in some of the mountainous regions of Patagonia." So an expedition was sent to Patagonia under the lead of Mr. Prichard † in search of the prehistoric mylodon. No mylodon was found, but there were valuable biological and ethnological results. They are embodied in a large octavo volume very profusely and beautifully illustrated, the whole forming about the heaviest book, for its size, that was ever published. It can no more be held in the hand to read than an old folio such as Dugdale's Baronage or a volume of Harris's Voyages. Mr. Prichard's account of the Tehuelches, of their physique, manners and customs, and methods of hunting is a valuable contribution to ethnology. For this interesting people are not a branch of the Inca group of tribes, but are isolated, and perhaps of Malayan origin. Mr. Prichard refers to their melancholy fate—too noble and too reserved to adapt themselves to changes caused by European encroachments, they are doomed, and nothing can arrest their proudly sad progress to certain extinction. This gives increased value to the sympathetic researches of an observant and intelligent traveller like Mr. Prichard, whose narrative is agreeably written. His zoological notes, describing the wild animals and their habits, are beautifully illustrated. Mr. Prichard believes that no great progress is possible in the formation of a flourishing pastoral industry in Patagonia, unless the farmers are supplied with vastly improved means of communication. Railroads are the great need.

POLAR REGIONS.

ANTARCTIC ZOOLOGY.‡

In a preface to this handsome and beautifully illustrated volume, Prof. Ray Lankester gives a brief sketch of the expedition of the *Southern Cross*, which, as our readers are aware, was initiated and led by Mr. C. E. Borchgrevink at the expense of Sir George Newnes. The collections dealt with were made mainly by the zoologist of the expedition, Mr. Nicolai Hanson, and Mr. Hugh Evans, the assistant zoologist, assisted by other members of the scientific staff. The death of Mr. Hanson in Victoria Land "was a great loss to the expedition, as it was to science generally, for, either from want of knowledge or want of care on the part of the survivors, his collections suffered considerably, especially in the case of the Invertebrata, as will be seen from the reports of the various specialists who have described them. The seals, of which there was a large series, were sent home in brine, but the tubs in which they were packed were not labelled in any way, and only a few specimens had leaden tickets attached to them. These had unfortunately become so corroded from immersion in the brine as to be, in nearly every case, undecipherable, and no list of the collection of seals was forthcoming. The memoir on the White seal which Mr. Hanson prepared, and which would undoubtedly have added much to our knowledge of this animal, was, I am informed, lost by some mischance on the voyage home. It is, therefore, to be regretted that the work will have to be done again by the naturalists on board the *Discovery* and other expeditions which may visit Antarctica in the future" (p. iv.).

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* 'Aconcagua and Tierra del Fuego.' By Sir Martin Conway. Cassell. 1902.

† 'Through the Heart of Patagonia.' By H. Hesketh Prichard. Heinemann. 1902.

‡ 'Report on the Collections of Natural History made in the Antarctic Regions during the Voyage of the *Southern Cross*.' London: Printed by Order of the Trustees [of the British Museum]. 1902.

Prof. Ray Lankester, as director of the Natural History Museum, entrusted Dr. Bowdler Sharpe with the preparation of the memoirs on the Vertebrata for the press, and Prof. Jeffery Bell with the Invertebrata. These naturalists and the authors of the numerous special memoirs have done their work well, and give us at least the comfort of knowing that the utmost possible has been made of the collections since their arrival at the museum. In addition to twenty articles dealing with the different classes of animals, there is one devoted to lists of the names of the scanty set of specimens of plant-life, and one to the rocks.

Unfortunately, the absence of labels or of specific information as to localities from the specimens deprives the description of species of their geographical interest. But, at least, we are at last in possession of an authoritative synonymy of the seals and birds most frequently referred to by antarctic explorers, and of very beautiful coloured pictures of the seals and some of the penguins. From Captain Barrett-Hamilton's description of the seals we learn that only four species are known from the antarctic regions, each the sole representative of a genus so far at least as those waters are concerned. As a rule the scientific name of a species has the merit of being one and distinctive, while the popular names are many and variable; but in the case of the antarctic seals there are so many scientific synonyms, due, no doubt, to the imperfect specimens and descriptions brought home, that we have to fall back on the popular names in order to be sure of which seal an author speaks.

The four definite species are as follows, the best-known popular name being given in small capitals, the scientific name now accepted in italics :—

1. WEDDELL'S SEAL, or false sea-leopard, *Leptonychotes Weddelli ;* also known at various times as a species of Leptonyx, Pœciliphoca, Stenorhynchus, or Otaria.
2. The LEOPARD SEAL, or true sea-leopard, *Ogmorhinus leptonyx ;* also described as of the genus Stenorhynchus or Phoca.
3. WHITE SEAL, or crab-eating seal, *Lobodon carcinophagus,* which has also been described as belonging to the genera Phoca, Stenorhynchus, Leptorhynchus, and Ogmorhynus, with a variety of specific names.
4. ROSS'S SEAL, *Ommatophoca Rossi,* which is happy in never having been miscalled, and from its portrait could hardly have been mistaken for any other creature unless it were a pouter pigeon on a gigantic scale.

Beautiful coloured drawings of the young, immature and adult forms of the common antarctic penguin *Pygoscelis Adeliæ* are given, and coloured representations of the eggs of three species of birds.

Among the fishes eight new species, including representatives of two new genera, have been found. These are figured, and they have received the names of the patron, leader, and chief members of the scientific staff of the expedition.

We hope that those who may in future be inclined to equip or lead expeditions into unknown regions will not be alarmed or discouraged by the honest and "faithful" manner in which the director of the Natural History Museum and the authors of the memoirs point out the imperfections of the records and specimens handed to them from the *Southern Cross*. It is essential, for the dignity of science and the self-respect of scientific men, that the responsibilities of those who set out with the avowed object of advancing science should be very plainly brought home to them.

ON A HITHERTO UNEXAMINED MANUSCRIPT OF JOHN DE PLANO CARPINI.

By C. RAYMOND BEAZLEY, M.A.

WHILE working lately in the Library of Corpus Christi College, Cambridge, I came upon a manuscript (No. 181, pp. 279–321) hitherto unknown except by the bare mention of its title in Nasmith's and other catalogues, which seems to have a distinct interest and value. It contains, in the most complete form, the text of John de Plano Carpini's account of the Mongols, and of his journey to the Great Khan's court (A.D. 1245–7). The last chapter of Carpini's *Historia Mongalorum* has hitherto been supposed to exist only in the Leyden manuscript known as "Petau," from its old possessor Paul Petavius; and as this chapter is the record of Carpini's journey to Mongolia and back, it is more valuable than any of the eight that precede it. Now, the whole of this final chapter is to be found in the Corpus manuscript referred to, whose value was wholly unknown to the eminent French scholar M. d'Avezac, when he prepared his remarkable edition of Carpini for volume iv. of the Paris Geographical Society's *Recueil de Voyages et de Mémoires publié par la Société de Géographie*, 1839. Its worth and content were equally unknown to Thomas Wright, who collated in a strangely casual manner the London manuscript of Carpini (B. Mus., Reg. 13 A. XIV.) for this edition of the *Société de Géographie.* The aforesaid edition of 1839 is, of course, still the standard, and, indeed, the only recognizable one of this great Franciscan traveller, for the truncated and corrupt text printed by Hakluyt, and generally accepted till 1839, is unworthy of comparison with that exhibited in the manuscripts of "Petau" and "Corpus" and in the Paris text.

It may be added that the Corpus manuscript contains in several places fuller and more satisfactory readings even than "Petau." M. d'Avezac, no doubt guided by the information or want of information he received from England about Carpini manuscripts, evidently considered that another manuscript of the *Historia Mongalorum* existed in Cambridge, viz. No. 61 (or rather one in No. 61) in the collection of "Bennet" College; but this is the very same thing as one in No. 181 in the present numbering of the Corpus collection, 61 being the number in Edward Bernard's catalogue, now superseded by 181 in Nasmith's. It is strange that this simple verification seems never to have been made hitherto. According to Bernard, moreover (*Catalogi librorum manuscriptorum Angliae* *et Hiberniae,* 1697; part iii., p. 133, no. 1337, referring to 61 in the list of *codices manuscripti Collegii S. Benedicti,* and to the third item in the sixty-first manuscript), the Carpini manuscript, called *Historia Monogallorum sive Tartarorum Pr. Omnibus fidelibus,* is the third piece in the volume, the Rubruquis manuscript being reckoned as the fifth. This reckoning is reproduced by d'Avezac (*Recueil,* as quoted above, p. 448), the great Paris geographer evidently considering that this manuscript of Carpini was only catalogued in Bernard. But, as a matter of fact, the Rubruquis text follows Carpini here without any interval whatever, and the two really form the eighth and ninth items in the volume. It is also noteworthy that Nasmith (*Catalogus librorum manuscriptorum quos Coll. Corp. Christ. et B. M. Virg. in Acad. Cantab. legavit Matth. Parker;* 1777; in the general heading to clxxxi., which is described as *seculo xv. scriptus*) speaks as if all the pieces were of the fifteenth century, whereas they are of distinctly varying date, and the two with which we are specially concerned (Carpini and Rubruquis) cannot possibly be later than the early fourteenth century, and were probably written before 1300.

As Carpini is in the first rank of mediæval explorers, standing but little below Marco Polo, the discovery of another manuscript of his complete text, preferable in some points even to the best hitherto collated, may not be without interest. The writing is of the latter part of the thirteenth century, or earlier part of the fourteenth (*c.* 1260–1320), and is in the same hand as the manuscript of Rubruquis known as D, which immediately follows, and the extracts from Æthicus which end the volume; the lines are long, running over the whole breadth of the page. The additions which "Petau" makes to the text of the earlier chapters (*De moribus Tartarorum,* etc.), and which are in several cases direct and avowed additions of the author revising his work, appear in "Corpus," *e.g.* the passage *haec autem quæ superius scripta sunt . . . possidebit,* following the words *adversarii manifesti,* with which all but these two manuscripts end. This passage contains an author's "personal note" to the effect that in the military details he has just given of the Mongol army, and of the best manner of resisting that army, he has no intention of trespassing on soldiers' ground, but only of furnishing *occasionem et materiam cogitandi.* The whole bears the most distinct evidence of belonging to a second revised and improved edition. The Corpus manuscript of Carpini is not only (with Petau) the fullest, it is also the oldest, text of the *Historia Mongalorum,* and it seems to have been written at latest within seventy years of the traveller's return from Central Asia, and probably (as Michel and Wright consider of the Rubruquis manuscript in the same hand, which follows) even before the end of the thirteenth century. It is, therefore, to all appearance a few years older than "Petau;" and the years 1260–1320 (above referred to) may be taken as an outside, 1270–1290 as an inside, date for its transcription.

THE MONTHLY RECORD.

THE SOCIETY.

The Antarctic Relief Expedition.—News of the safe arrival at Lyttelton, N.Z., of the British Antarctic Relief Expedition in the *Morning*, was received about the middle of November. During the long voyage from this country, which had lasted over four months, the *Morning* had only once been spoken by a passing vessel, and this in the Atlantic before the Cape had been passed. But the confidence which had been felt in the qualities of the ship, no less than of her captain and crew, was fully justified by the event, the arrival of the ship at New Zealand having taken place little, if at all, behind the calculated date. By the courtesy of the Eastern Telegraph Company, Captain Colbeck has been permitted to telegraph the news of his arrival to the Society free of charge. His message, despatched on November 17, states that the expedition arrived on the previous day, all well. Everything had turned out most satisfactorily, the *Morning* having proved herself an excellent sea-boat during the heavy gales which had been experienced between 40° and 51° S. The ship will be docked for cleaning, though no extensive repairs are necessary. Captain Colbeck will leave as soon as possible after taking in coals and stores, arrangements for which have already been made, and he mentions December 2 as the date on which he hopes to sail. All on board are looking forward with eagerness to the commencement of work in the Antarctic, while every assistance has been afforded by the authorities and others at Lyttelton, including the officers and crew of H.M.S. *Torch*.

Presentation to the Library and Map Collection.—A valuable gift has been made to the Society by a member of its Council, Mr. Henry Yates Thompson, to whose liberality the Society was already indebted for several important additions to its collection of early atlases and geographical treatises. The present donation includes ten folio volumes of the same character, which will do much towards completing a thoroughly representative set of works of the kind, dating from the early days of exact modern geography ushered in by the discovery of America. The first in point of time is a fine copy of the second edition of Ptolemy by Servetus ("Villanovanus"), printed in 1541 at Vienne in Dauphiné, and giving a corrected version of Pirckheimer's translation. The maps, which in the present copy are finely coloured, are printed from the same blocks as those in the 1525 Strassburg edition, and include, like the latter, the 1522 map by Laurentius Phrysius, as well as another of the new world, copied in the main from that in the 1513 Strassburg edition. The Servetus Ptolemy is famous for the trial and execution of its editor at the instigation of Calvin, who caused many copies of both his editions of Ptolemy to be burnt. Two editions of

Ortelius and two of Mercator may next be mentioned. The former are the 1603 Latin edition and the corresponding English edition of 1606, of neither of which the Society has hitherto possessed a complete copy, though a former gift of Mr. Yates Thompson had supplied the 1579 Latin edition. The Mercators are the English editions of Hexham (1636) and Saltonstall (2nd edit., 1639). Then come the maps of England and Wales by Christopher Saxton, with the additions by Philip Lea, and the early Latin edition (1616) of Speed's 'Theatre of the Empire of Great Britain.' The list is made up by Barlæus' splendidly illustrated description of Brazil, containing an account of the doings of Count Maurice of Nassau; a set of engravings of the House of Lords' tapestries depicting the defeat of the Spanish Armada, with reproductions of contemporary maps of the British coasts, published by John Pine in 1739; and a set of facsimiles of maps of the escheated counties in Ireland, prepared in 1609 in connection with the settlement of lands which had been forfeited during the rebellion in Ulster. It is proposed to place these books, with other important early works previously in the possession of the Society, in a special case in the council room.

EUROPE.

New Descent of Helln Pot, Yorkshire.—The *Yorkshire Weekly Post* of October 25 contains the account by Mr. G. T. Lowe of a recent exploration of the famous Helln Pot (erroneously also called Alum Pot), in the West Riding of Yorkshire, which was accomplished by a party of the Yorkshire Ramblers' Club on the occasion of the last annual meeting. Several other descents have of course been made, including one by members of the same club in 1900, but it is claimed that in none of these was so complete an exploration carried out as has now been done. On the day previous to that fixed for the descent a preliminary exploration of the two passages leading down to the abyss was made, for the purpose of deciding on the route. The underground stream had been diverted from its present course into the older one known as the Long Churn, and the bed thus laid dry was followed up. It was found to lead to a large underground chamber, which the flare lamps were unable to fathom although lowered 100 feet into the abyss. It was therefore decided to use the traditional route by the Long Churn. This passage debouches into the north end of the uppermost and widest part of the pot, about 80 feet below the surface. A little below the outlet there is a terrace which runs round the greater part of the sides, while a huge fallen block, wedged between the opposite sides of the cleft, forms a bridge. From this ledge the descent was made by rope ladders to the sloping floor of the upper section of the pot, which has then to be followed, occasionally by steep descents, in a northerly direction beneath the Long Churn. A small stream, the result of two waterfalls, runs down the channel here formed, and as the black limestone which now takes the place of the white band above is very slippery, much care is needed to maintain a foothold. The last drop leads to a black sheet of water of no great depth, to the west of which is a vast hall about 80 feet high, with a rough stone-covered floor. From the east comes a large waterfall some 60 feet high, evidently discharged from the passage explored the day before, though the intervening stretch is still unknown. The water finally passes from sight in a quiet pool at the northern end. Mr. Lowe speaks enthusiastically of the variety and beauty of Helln Pot, and though difficult, the descent is less dangerous than those of either Gaping Ghyll or Rowten Pot. The first descent took place in 1847, and others were made in 1848, 1870, and 1900. For that of 1870, which is fully described in Mr. Boyd Dawkins' well-known work, great beams were fixed across the mouth of the pot, but these in time became rotten, and their remains were found at the bottom by the party of the present year, ten members of which reached the final pool.

The Ben Nevis Observatory.—Much regret was recently felt at the announcement, by the directors of the Ben Nevis and Fort William Observatories, that these were to be discontinued at the beginning of October last. It was urged by those interested in the observatories that an effort should be made to keep them at work for a time at least, until the committee of inquiry appointed by the Treasury to examine into the administration of the grant to the Meteorological Council had presented its report, and a possibility should thus be afforded for the adoption of new arrangements. This suggestion, we are glad to state, has been acted on, a memorandum issued in November by the directors of the observatories announcing that the necessary funds have been obtained to provide for the continuance of the work, as heretofore, for two years more, *i.e.* till October, 1894. The whole of the funds for the second year have been generously provided by one donor.

The Alps.—Prof. Penck, of Vienna, delivered a lecture on "Das Antlitz der Alpen," to the Congress of Naturalists at Karlsbad, in September last. The following is a brief abstract. Although young in a geological sense, the Alps must be regarded from the point of view of modern geomorphology as fully matured mountains, for their relief is no longer determined by the law, "The highest is what was raised highest by mountain-building forces"—but "The hardest is highest." Some parts show signs of great morphological age, like the "Rumpf-vorland" of Upper Bavaria. Only the really recent elevations are isolated; and these occur only in the outer parts (*Vorlande*), their absence in places where a crushing (*Stauung*) of the mountains against raised masses before them has taken place being remarkable, as, for example, in the *massif* of Bohemia. Although the Alps display certain youthful characteristics in places, these are associated with the amount of glaciation they have undergone, rather than with the date of elevation. The glacial topography is that of a stage before full maturity. This is most clearly seen in the unglaciated regions, but traces of it are apparent even within the regions of the old ice-period glaciers: in the mature glacial forms, with their uniformly smoothed slopes, tremendous erosive action has cut through the slopes, making them very irregular or even reversing them and forming lakes in the valleys or on their flanks. But on the whole the main outline of the drainage system of the Alps has changed but little (a remarkable example of the sporadic changes is found in the shutting off of the Achenthal from the Innthal—see *Geographical Journal*, February, 1901, p. 187). The original formation of mountains is reflected directly or indirectly, but the special charms of the Alps, the lakes, the magnificent waterfalls, the sharp ridges, and the bold peaks, are the work of the ice period.

The Bora in the Adriatic.—Lieut. Kessler, of Pola, read a paper before the meteorological section of the Karlsbad Congress on the bora in the Adriatic, and its relation to the weather conditions. He distinguished two main types of bora, anticyclonic and cyclonic. The former is characterized by the occurrence of strong squalls on the eastern coasts and littoral, with clear dry weather and moderate cold; the cyclonic bora is much stronger and steadier, is not restricted to the eastern coast, but often extends as far as the coast of Italy, and is usually accompanied by overcast rainy weather, with snow and intense cold in winter. Greater certainty in forecasting the bora is expected as the result of the scientific balloon ascents which have recently been carried out with increasing interest.

The Frontier between Hungary and Galicia in the Tatra.—A small rectification of this frontier-line has taken place as the result of an award by the President of the Swiss Confederation on September 13 last. The question was one of long standing, but has lately come to the fore, and was in 1897 referred by the Governments of Austria and Hungary to the decision of an arbitrator. The doubtful section of the boundary was in the neighbourhood of the Meerauge and Fischsee—two mountain tarns situated in the finest part of the Tatra from the point of view of scenery—through the latter of which the boundary ran, according to most recent maps, though its validity has always been contested by Galicia. The opposing parties based their contention on agreements and other documents dating from 1589 onwards, which showed that, though once possessed by Hungary, the debatable area had been in the undisputed possession of Poland at least from 1624 to 1769. Another point at issue was that of the true upper course of the Bialka river, which had been shown as the boundary in the older maps. Before giving his decision, the arbitrator visited the locality in person, and came to the conclusion that the line which best agreed with old descriptions, and at the same time formed the most natural frontier, was one running south from the junction of the two upper branches of the Bialka, along the ridge which terminates at the Meeraugenspitze, on the main range of the Tatra. This line, which is shown on a map in the *Deutsche Rundschau für Geographie* (vol. xxv. No. 2), gives both the tarns alluded to to Galicia.

Journey in the Istranja Dagh.—We have received the following note by Dr. F. X. Schaffer, on a recent journey in eastern European Turkey, from our Vienna correspondent, Dr. Penck: "With the view of obtaining fresh light on certain current tectonic questions, I made a journey in September last through the part of eastern European Turkey known as the Istranja Dagh. I crossed the mountains four times, and thus had an opportunity of determining the main lines of their structure. From Adrianople I first made my way eastwards through Tirnovo to Iniada, thence back over the mountains to Wisa, then to the sea again at Midia, and finally to the eastern railway at Cherkesköi. The northern group of mountains, formed of archæan rocks, is the oldest; it rises to elevations of 4000 feet, is deeply eroded, and covered with dense primeval forest. In the neighbourhood of Pineki the mountains are lower, reaching only to about 1500 feet; they consist of ancient rocks rising as inliers through the horizontal strata of early Tertiary limestone, which more to the northward only form a rim round the main mass, but in the south extend from the western margin of the mountains eastward as far as the Black sea. A marked change in the scenery accompanies the change of formation. We have now low ridges separated by narrow valleys with steep sloping sides, the forests disappear, and the water-supply is very deficient. Between the Istranja Dagh on the east, the Arda *massif* on the west, and the Tunja *massif* on the north, lies the basin of Adrianople, which extends southwards to the Kuru Dagh and the coast. This ancient lake-bed is filled up by fresh-water deposits of lower Tertiary age, which in many places contain beds of workable brown coal, notably between Uzun Köprü and Keshan. I examined these beds on the way from Uzun Köprü to Keshan *viâ* Kistombul and Harmauli, and further on to Ferre, and studied their economic importance to a region so poor in coal. Thanks to the care of the Turkish Government, I was able to traverse these little-known and difficult regions without the slightest inconvenience."

ASIA.

Dr. Leonhard's Researches in Asia Minor.—Dr. Richard Leonhard of Breslau explored some of the least-known regions of Asia Minor, in the mountains north and north-west of Angora, during 1899 and 1900 (*Geographical Journal*, February, 1900, p. 175), and he has now published a morphological study of one geological section of the country, and a sketch-map on the scale of 1 : 1,000,000 (*Jahrbuch für Mineralogie, Geologie, und Palæontologie*, Beilageband xvi. Stuttgart, 1902). Dr. Leonhard calls the area to the north of a line joining Eskichehir and Angora the Anatolian face, and the great bow of the Sakaria, south of Eregli to the Black sea, the Galatian andesite region—after the ancient province of Galatia, and the masses of eruptive rock which determine the character of the scenery. The andesite zone runs, on the whole, in an east and west direction, between the towns Mudurnu and Tshangry, a distance of about 100 miles; its mean breadth is about 30 miles. Only two competent geologists have visited this region before Dr. Leonhard. The excellent observer, William Ainsworth, made a short journey in 1838, and P. von Tschichatsheff crossed the mountains by various routes in 1849 and 1853, making extensive topographical and geological observations. Tschichatsheff's topographical work was, however, inadequate, and Kiepert's map, based on it, is unreliable. Considerable additions have recently been made in this respect by the Prussian officers von Diest, Anton, and others. Leonhard's sketch-map is really part of a still unpublished map of Northern Asia Minor, which contains much new information chiefly drawn from his own surveys, and seriously modifies existing maps of the region. The fundamental rocks of the mountain area are the upper Cretaceous and Eocene beds of the Jura, and upon these rest the andesitic lavas in which the surface forms are modelled. The folding of these rocks was completed in Miocene times. They form a series of arcs, which Eduard Naumann has called the "west-frontier arches" (*Westpontischen Bogen*). The andesitic lavas burst through after the folding, during the Eocene period, at the points of intersection of folds. To the west they form a plateau-*massif*, resting on the Ala-dagh, rising 2600 feet above it, and cut through by rivers. The centre of the plateau is the grass-covered cone of Köroglu, 7770 feet high, remarkable for the number of springs originating in it. Crowned by a pyramid of naked andesite 80 feet high, the cone rises 920 feet above the surrounding wooded plateau, and on the north sinks suddenly in a caldera 1300 feet deep. The unfriendly attitude of the inhabitants unfortunately prevented Leonhard from fully exploring this remarkable region. North-north-west from Köroglu a series of elevations extends to the Semen-dagh, culminating in the peak of Ramazan-Beijoglu, 6600 feet high. To the east the Alush-dagh rises independently, forming the central axis of the whole range. This retains the plateau character, and is extremely difficult to cross on account of the steepness of its valleys. On the summit of the plateau the more resistent parts of the rock present a wool-sack appearance, recalling the granites of the Riesengebirge. Ainsworth recognized the intrusion of basalt in the eastern part of this group by the characteristic columnar formation. Here are found the sulphur springs of Sei-hamam and Kisilja-hamam, and in the valleys earthquakes are of frequent occurrence. Further to the east this central group includes the Tilderim-dagh and the Tash-Karajalar (over 6600 feet). To the north, the andesite zone subsides into long ridges trending north-eastwards; to the south isolated heights rise in the Karagöl-dagh to 6200 feet, and in the Urush-dagh and Chedir-dagh even higher, but still the plateau character persists. The characteristics of the eastern part are more directly continued southwards, in the Tilderim-dagh, mentioned above, in the Aidos-dagh and the Idriz-dagh, north and north-east of Angora. The river Chibuk, which unites with the Angorasu near the town, flows southward across a plateau of andesite from the angle at Sarai; and on the western slopes of its valley of erosion, immediately to the north-east of the inner city, are the vineyards and villas of the Angorians. The highest point of the plateau is the triple-peaked Hussein Geazi, which rises 1300 feet above the town of Angora, to the east of it, and dominates the landscape to an extent which does not appear from existing maps.

Prof. Musil's Explorations in the Deserts of Northern Arabia.—In a letter dated from the Gharandel springs on September 11 last, and addressed to Hofrath David Müller in Vienna, Prof. Alois Musil, the discoverer of the castle of Amra (see *Geographical Journal*, July, 1902, p. 101), gives an account of another journey in the desert, begun on August 18. After a stay of four days in Jerusalem, Prof. Musil went to Gaza, where he spent seventeen days collecting ethnographic material, and from there he set out with three camels, and three Beduins whom he had obtained from the remotest districts of the ancient Edora. The intrepid explorer once more penetrated to regions hitherto unvisited by Europeans. In addition to the discovery of a building which is undoubtedly an Amra in miniature, and the collection of inscriptions and other materials of surpassing linguistic and historical interest, he has obtained many photographs and plans of ruins and buildings, in particular of the necropolis of Obde. But the chief geographical interest attaches to his surveys of the region between the Wadi al'Araba and al-Ans, and from as-Selêle to the Red sea. Prof. Musil intended to explore the Wadi al'Araba further in all directions. During his sojourn of several weeks in the desert the temperature ranged from 43° to 108°, but was always quite bearable. The inhabitants proved more disagreeable. Prof. Musil was attacked twice, and minor troubles with small parties were of daily occurrence. The expedition returned safely to Ma'ân shortly before the end of September.

The Franco-Siamese Agreement.—A treaty was signed on October 7 between France and Siam, by which, if duly ratified, the various questions which have been at issue between the two countries for the past few years will at last be settled. The first article provides for the rectification, in favour of France, of the frontier between Cambodia and the Siamese provinces of Battambang and Siemreap. The new line starts from the eastern shore of the Tonle Sap, or "great lake," at the mouth of the Stung Roluos river, following the parallel in which this is situated eastward to the Srek Kompong Tiam, and then running due north to the Pnom Dang Rek range. It follows the water-parting (formed by this range) between the basins of the Nam Sen and Mekong on the one hand, and that of the Nam Mun on the other, finally running east to the Mekong along the crest of the Pnom Padang range. North of this the Mekong is still the eastern frontier of Siam. The second section of this article defines the western frontier of the part of Luang Prabang situated on the right bank of the Mekong between the embouchures, in the latter, of the Nam Huong in the south, and Nam Kop in the north, the line running for the most part along the Mekong-Menam water-parting. This does not mean that this territory is annexed by France, for the third section stipulates that no change is to be made in the relations between Siam and this part of Luang Prabang. The remaining articles of the treaty provide for the evacuation, by the French troops, of the town of Chantabun, so soon as the territory now ceded to France is evacuated by Siam; for the abrogation, subject to certain conditions, of the restrictions imposed upon Siam with regard to the neutral zone on the right bank of the Mekong; for certain rights to be exercised by France in the Siamese portion of the Mekong basin, relative to the construction of public works by Siam; and for modifications in the rules under which various classes of Asiatics resident in Siam enjoy the protection of France. The treaty must be ratified within four months of its signature, but considerable opposition to it is being shown on the part of the French Colonial party.

An Early Journey into Tibet.—In the Mozzo-Borgeth public library at Macerata is a narrative of a journey into Tibet, accomplished in 1738–1739 by a certain Fra Cassiano Beligatti, a Capuchin missionary who sojourned in the country till 1756, and was also the author of an 'Alphabetum Thibetanum' and other works. The first volume of the journal, with some condensations, has been published by Prof. Alberto Magnaghi in the *Rivista Geogr. Ital.*, vol. viii. pp. 545 and 609, and vol. ix. pp. 39, 105, 170, 244, and 299. It describes the author's voyage to the mouth of the Ganges, his journey across northern India to Nepal, the towns he visited in that country and the ceremonies he witnessed, and his arrival at Kuti on the Tibetan frontier. The route through Tibet, which ran by the Tung-la, Dingri valley, Gyangtse, and Yamdok-cho, as well as the reception of the missionaries by the king, are treated at greater length; and the customs of the people, their food, ceremonies, etc., are depicted with an amount of detail very unusual in the writings of the early missionaries. At the conclusion of the first volume the author promises to give in the next a more complete account of the Tibetans and their country, as well as of the kingdom of Nepal. Unfortunately, the manuscript has been lost. Some additional information, however, is to be found in Fra Cassiano's life of one of his companions, P. Giuseppe Bernini, though not sufficiently full to compensate for the loss. It is remarkable how little the habits of the Tibetans have changed since the author's time, and how many of his statements are confirmed by P. Huc and other later travellers.

AFRICA.

Literature of Somaliland.—The attention now directed to Somaliland will no doubt lead many of our readers to desire information on the literature respecting that country, the most important items of which are therefore here summarized. Although Somaliland has been visited by so many travellers and sportsmen within the last decade, the literature on the region in which the recent operations have taken place is not so extensive as on some other parts of the country, the routes of the more important expeditions having taken a line more to the west. Captain Swayne's work, entitled 'Seventeen Trips through Somaliland' (1st edit. 1895; 2nd edit. 1900), is perhaps the most generally useful popular account of Northern Somaliland; while the region between the coast and Bohotle was described in the papers published in the *Journal* for January, 1898, accompanied by a map, on the journeys of Messrs. Parkinson, Brander Dunbar, and Aylmer. Count Wickenburg's journey in Northern Somaliland was described (with map) in *Petermanns Mitteilungen* for February, 1898. Of works dealing with Somaliland in general or other parts of the country, Mr. F. L. James' 'Unknown Horn of Africa' (1888 and 1890); Captain Bòttego's 'Il Giuba Esplorato' (1895); Dr. Donaldson Smith's 'Through Unknown African Countries' (1897); Captain F. B. Pearce's 'Rambles in Lion Land' (1898); Mr. C. V. A. Peel's 'Somaliland' (1900); and, above all, Mr. A. E. Pease's magnificently illustrated work, just issued in three large quarto volumes, may be specially mentioned. Papers in periodicals are numerous, the *Bolletino* and *Memorie* of the Italian Geographical Society containing in particular accounts of the journeys of Robecchi, Bòttego, Ruspoli, and others, which did so much to throw light on the more southern and western parts of Somaliland. The best map is that lately issued by the Intelligence Division of the War Office as a part of the general map of Africa, on the scale of 1 : 1,000,000, now in course of preparation. The sheets of this map dealing with Somaliland are Nos. 68, 69, 80, and 81, the first-mentioned including the country between Berbera and Bohotle. The sheets are on sale by Stanford at 2*s.* each.

M. Fournet's Expedition to Abyssinia.—The October number of the *Revue Française* announces the arrival at Adis Abbaba in February last of the French expedition under M. Duchesne-Fournet, after a successful journey from Jildessa, through the borderlands between the Somali and Danakil countries, and the region along the middle course of the Hawash. The journey was made in part by new routes, which avoided the difficulties as to water-supply experienced by other travellers. A survey has been carried out by Lieut. Collat, the second in command.

Discoloration of the Rocks at the Nile Cataracts.—An investigation lately undertaken by MM. Lortet and Hugounenq at the first and second cataracts of the Nile has thrown light on the mode of origin of the intensely black shining surface of the rocks at those points, which gives them the appearance of a bright kind of coal (*Comptes Rendus*, Paris Academy of Sciences, vol. 134, No. 19). The brilliance of the rocks is said to be due to the friction of the sediment contained in the Nile water, but the black colour is a result of the chemical composition of the rocks. At the first cataract they are mainly eruptive (syenites, granites, porphyries, etc.), but at the second they consist of sandstones containing large quantities of iron and manganese. It is from the decomposition and peculiar oxidation of the silicate of manganese contained in both series of rocks that the black colour is said to be due, chemical tests showing that the surface coating consists of a thin layer of black bi-oxide of manganese. That this is not a sediment derived from the water is shown, in the authors' opinion, by the absence of the discoloration from the rocks of the river-banks below the cataracts; and they attribute its formation at the latter to the influence of the special climatic conditions prevailing in that region. They do not, however, clearly account for the fact that it is especially in the neighbourhood of rapids and cataracts that this discoloration is found. Besides the instances mentioned to the authors by Dr. Schweinfurth, viz. the rapids of the Niger and Congo, at the latter of which the phenomenon was observed during the course of Captain Tuckey's expedition, we might point to the case of the cataracts of the Orinoco, the discoloration of the rocks at which point was observed by Humboldt and discussed in chapter xx. of his 'Personal Narrative.'* Probably the required silicate of manganese is a common ingredient of the rocks by which cataracts are occasioned, but it does not seem clear why similar rocks are not equally discoloured at other points on the river, unless it be that the rush of water is a reason for the absence of vegetation, which is mentioned as favouring the occurrence of the phenomenon.

AMERICA.

Mr. David Hanbury's Expedition to Northern Canada.—We have been favoured with a copy of a letter from Mr. David Hanbury, describing the progress made down to February last with the new expedition he has undertaken to the northern regions of Canada. His former expedition, carried out in 1899, was described in the *Journal* for July, 1900. Mr. Hanbury wrote from the neighbourhood of Depot island, in Hudson bay (63° 59′ N.), where he had been spending a part of the winter on board the schooner *Francis Allyn*. He had left Fort Resolution, on Great Slave lake, early in July, travelling down the Arkelinik river, explored by him in 1899 (the Theron of Mr. J. W. Tyrrell), to Baker lake, above the head of Chesterfield inlet. The journey was an easy, and for the most part an enjoyable one, though flies and mosquitoes proved very troublesome, and food supplies having run out, the party was dependent at last on the game and fish that could be procured. Mr. Hanbury had arranged to meet the *Francis Allyn* at Marble island, south of Chesterfield inlet; but not finding the vessel there, learnt through letters brought by the Eskimo that she was at Depot island. To avoid passing the whole winter in idleness on board, Mr. Hanbury hurried back, after a visit to the ship, to Baker lake, which was to the starting-point in the spring, in order to join the Eskimo in a musk-ox hunt, at the same time transporting thither a part of his stores. The day after arriving at the head of Chesterfield inlet (October 12) the river flowing out of Baker lake was frozen hard, and on the 20th the party went into snow-houses. November and the best part of December were spent on the hunt; and though no oxen were killed, caribou was fairly plentiful, and perfect weather was enjoyed the whole time. The ship was reached again early in January, and at the time of writing Mr. Hanbury hoped to make a start in a few days, an early move being thought advisable, in order to ensure reaching the Arctic coast on the snow with the dogs and sledges. The former were scarce, which would necessitate some curtailment of the journey. From Baker lake Mr. Hanbury proposed to go west to Ti-bi-elik lake (cf. map in *Journal* for July, 1900), and thence strike north, crossing the Back river and arriving on the Arctic coast about May 1. In June and July he hoped to explore the coast region, and in August to proceed *viâ* the Coppermine river to Great Bear lake, and thence to Fort Norman on the Mackenzie. If all went well, he expected to be back at Edmonton, *viâ* the Mackenzie, before the end of the year; but he recognized the possibility of being frozen up further north. For the journey he had got together a considerable party of Eskimo, the men taking with them their wives and children. The winter had been an exceptionally good one, with very little really cold weather, though the mean temperature for January was −30°, the lowest reading being −57°.

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* Humboldt described the rocks at the "Raudal de Cariven" as very black, and glossy like lead. He recognized the discoloration as associated with the presence of manganese and iron in rocks; with the periodic overflow of rivers; and with the climatic conditions which prevail; but was inclined, also, to attach some weight to the force of impact of the water.

The Coppename Expedition.—Major L. A. Bakhuis, leader of the expedition, describes fully the incidents of the journey in the *Tijdschrift* of the Dutch Geogr. Soc., No. 5, 1902. In August last year he and his companions, H. H. A. J. van Stockum, H. A. Boon, and W. L. Loth, were conveyed in a steam launch to the Raleigh falls, in lat. 4° 43′ 3″ N., and long. 56° 13′ 33″ W. Near the camp stands the Voltzberg, a granite hill 790 feet high, whence a view of the country to the south was obtained. It was perceived that a range of mountains with summits 3000 to 3600 feet high runs north-westwards, probably from the Tumac-Humac mountains. This was subsequently named the Wilhelmina range. Directly south rose the Hendrik top (3500 feet), connected with the Wilhelmina range by the Emma range, as it has been named, which continues north-north-eastwards to the Jan Basi Gado on the Saramacca river. From the summit of the Voltzberg, Van Stockum calculated a base terminating on the slope of the Van Stockum Berg, about 2 miles to the east, and took observations of the distant heights, one of these being the Hebiveri (1480 feet), where another observatory was subsequently formed. Not far above the camp at the foot of the Hebiveri, in lat. 4° 24′ 35″ N., and long. 56° 33′ 11″ W., the river divides into two branches. The western branch was ascended by Van Stockum for a distance of 29 miles. At the highest point reached the river was merely a brook, and so obstructed by fallen trunks that further progress was impossible. Bakhuis and Loth followed the other branch, which flows through marshy land, and is very shallow in its upper course. The river basin consists of flat land studded here and there with solitary hills, and bordered on the south-south-east and south-west by mountains, which sink northwards to hills only 500 to 600 feet high. All the country, except the highest peaks and ridges, is covered with forest containing some very fine timber. The rock specimens collected in the neighbourhood of the river are few in number. Granite was the rock most commonly met with, containing here and there veins of diabase and quartz, in which no trace of gold was found. The granite runs in undulations across the country, generally from east to west, producing rapids where it crosses the river-beds. In the upper course of the right branch no hard rock was seen. Small botanical and zoological collections were brought home, and a number of photographs, some of which have been used to illustrate the report. A map on the scale 1 : 200,000 is also appended.

The Second Austrian Scientific Expedition to Brazil.*—The Royal Academy of Sciences of Vienna is preparing a second scientific expedition for the exploration of Brazil, which will be despatched in January, 1903. The special object of the explorers is the investigation of the zoology of the Parnahyba region, in north-eastern Brazil, from the sources of the river to its mouth. The fauna of this region is entirely unknown, and in other respects it has been little explored. Hofrath Dr. Steindachner will be the leader of the expedition, and he will be accompanied by Dr. Arnold Penther, keeper of the Vienna Hofmuseum, of the zoological department of which Dr. Steindachner is director, and Herr Othmar Reiser, keeper of the Landesmuseum at Sarajevo, with Herr Santorius as taxidermist, etc. The party will land at Bahia (San Salvador) and thence make its way by rail and steamer (on the San Francisco) to Barra (Cidadeda), the Paranahyba region being reached from there by boats and mules. The course of the river will be followed from the source northward to the mouth, and excursions will be made eastward and westward to the mountains on each side, which are little known. The journey is expected to occupy about nine months. Dr. Steindachner will probably devote special attention to researches on fishes and insects, and to questions of distribution, more especially of the birds, in the coastal regions and the steppes of the interior. Topographical and photographic surveys will also form part of the work of the expedition, which has been prepared and equipped with exceptional care.

AUSTRALASIA AND PACIFIC ISLANDS.

Exploration in Central Australia.—The *Adelaide Observer* for October 4 last contains some details as to an expedition to the eastern division of Western Australia, carried out in 1900 by Mr. H. W. Hill on behalf of a syndicate. The object was to prospect for minerals, etc., in the region of the Barrow, Rawlinson, and other ranges by which the great Australian desert is broken between 24° and 27° S. The route followed led from Lake Wells in an east-north-easterly direction past the Von Treue tableland and the Warburton, Barrow, and Rawlinson ranges, to the Petermann range across the south Australian border. Like Mr. Maurice, whose journey to this region from the South coast was briefly described in the *Journal* for June last (p. 760), Mr. Hill considers a part of the country explored decidedly auriferous. He also considers that artesian or sub-artesian waters exist in this region, and should not only make possible the opening of a stock-route between South and Western Australia in the approximate latitude of 26°, but may prove of assistance for the trans-Australian railway scheme. That periodic rains, sometimes even taking the character of a deluge, fall in the vicinity of the ranges referred to is, he says, proved by the number of creeks that radiate from them at close intervals, though the water appears to sink beneath the sand after a few miles, and to make its way southwards to the sea by underground channels. The water discovered by the expedition was in the midst of the desert—a flat country covered with sand and spinifex. A hole was dug to a depth of 18 feet in the rotten gneissose rock underlying the sand, and water could be taken out by bucketsful without appreciable decrease in the depth.

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* For an account of the first expedition, see *Geographical Journal*, February, 1901, p. 195, and December, 1901, p. 625.

The British Pacific Cable.—The last link in the All-British Pacific cable was supplied on October 31 last, on which date messages were exchanged between Canada and Australia, the first direct telegraphic communication between the opposite shores of the Pacific ocean being thus effected. The result is one on which all who have worked perseveringly for this object may well be congratulated. Apart from the project, brought forward fifty years ago, for the laying of a cable between America and Asia across Bering Straits, the idea of a Pacific cable first took shape last century in the early seventies, among the proposals then made being one by Mr. (now Sir) Sandford Fleming in connection with the Canadian-Pacific railway scheme. A route was surveyed by the U.S. ship *Tuscarora* in 1874, and in 1879 an American scheme was set on foot by Mr. Cyrus Field. The matter may be said to have been finally brought to the fore by the petition for a survey made by Canada in 1884; for though this was not granted by the home Government, the project has not since been allowed to rest, being discussed at the colonial conference of 1887, at the postal conference at Sydney in 1888, and at a conference of colonial representatives held at Ottawa in 1894. In 1895 Mr. Chamberlain appointed a Pacific Cable Commission, which presented its report in January 1897, though this was not made public until 1899. A further conference on the subject was then summoned, with the result that a definite scheme was at last adopted, tenders being invited, and that of the Telegraph Construction and Maintenance Company accepted in 1900. A permanent board of control was constituted in February 1901, and the Pacific Cable Bill passed its second reading in the following August. From Vancouver in British Columbia the route goes *viâ* Fanning and the Fiji group to Norfolk island, where it branches, one branch going to Australia, the other to New Zealand. Meanwhile the project for an American Pacific cable has begun to take shape, the route selected being that from San Francisco, *viâ* Wake and Guam, to Manila. There can be little doubt that before very long this project too will be an accomplished fact.

German Scientific Expedition to the Pacific.—In the summer of 1900 Herr Bruno Mencke undertook a scientific expedition to the Pacific, having acquired for the purpose the *Princess Alice*, the well-known steam-yacht of the Prince of Monaco, which was re-christened the *Eberhard*. The expedition ended disastrously, owing to a treacherous attack by the natives of St. Matthias; otherwise results of considerable value might have been expected, as, in addition to the leader, whose principal attention was given to ethnology, it was accompanied by two zoologists. One of these, Dr. O. Heinroth, gave an account of the expedition before the Berlin Geographical Society in June last, and an abstract of the paper appears in the *Zeitschrift* of the Society (No. 7, 1902). The *Eberhard* reached Herbertshöhe in New Britain on December 5, and at the end of the month made a short voyage to the New Guinea coast, where the Hercules river and a small river which enters Adolf haven near the southern extremity of the German territory were ascended as far as they were navigable, the inhabitants of the district proving friendly, though they had had no previous intercourse with

Europeans. Adolf haven is praised both for its scenic beauties and its excellence as a harbour. The line of coast hereabouts marked on the coast as mainland proved to consist of a series of islands with lagoons behind them. On the return voyage the ship touched at the Gracious islands, off the south coast of New Britain, and the Henry Reid river. The former would seem to hardly fulfil the expectations raised by their name,* for they are described as inhospitable. A more important expedition was next undertaken to St. Matthias island, to the north-west of New Hanover, which until the last two or three years has remained almost unknown to Europeans. The main island, which is compact in shape, is traversed by three mountain ranges running from north-west to south-east, the highest point (some 2000 feet) occurring in the central ridge. The thick forest is broken here and there by patches of what looked from the ship like grass land, but which may consist of low bush. Off the southern part of the main island lie several small islands and reefs, one of the former, which has a good anchorage, being the site of a recently established German trading station. The *Eberhard* anchored here, but soon afterwards the expedition moved across to the south-east corner of the main island, a camp being formed on a spot surrounded by dense bush. This was, on March 30, 1901, the scene of an attack by the natives, which cost the life of one European, and left the leader so severely wounded that he succumbed on April 2. This virtually brought the expedition to a close, Dr. Heinroth taking the remainder of the party back to Herbertshöhe and Matupi, but utilizing the stay at the latter place for ornithological collections; while before returning to Europe he paid a visit to the west coast of New Ireland. The paper concludes with some general notes on the climate, etc., of the Bismarck archipelago.

POLAR REGIONS.

Departure of the Scottish Antarctic Expedition.—This expedition, the organization and projected programme of which were described in the October number of the *Journal*, sailed on November 3, and the arrival of the ship at Madeira was reported on the 21st of the month.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

A Theory of Volcanic Eruptions.—M. Stanislas Meunier contributes an interesting and suggestive paper on the theory of volcanic outbursts, *à propos* of the recent eruptions in the West Indies, to the *Revue Scientifique* of August 2. He assumes that, from the surface down to a certain limited depth determined by the temperature, all rocks are saturated with water, while beyond that depth the heat is too great for water to penetrate. A fracture of the nature of a reversed fault, caused by thrusting, would place a hot dry layer below the critical level in contact with a moist layer above it; with the result that the rocks along a part of the line of contact would have their melting-point lowered, and would take up water in combination, tending to increase in bulk, and forming a mass having many of the properties of ordinary lavas. The swelling of the mass at a line of weakness would tend to fracture the superincumbent rocks; the relief of pressure so obtained would set free large quantities of the occluded gases and vapours, and these would bring with them rock materials in a solid and molten state. A close analogy occurs in the case of a bottle of soda water when the cork is taken out, the sudden liberation of the gas in solution driving part of the water out of the bottle. Thus volcanic lava, so far from being a material distributed as a continuous layer in all parts of the earth, is a special product of regions which have just undergone profound geological changes, and the significance of this in relation to the geographical distribution of active volcanoes is very great. Again, it becomes evident that the depths at which centres of activity—*i.e.* "pockets" of swelling or expanding material—are developed may vary considerably; and we are able to account for the fact that volcanoes near one another may be quite independent, while others, more distant, may act sympathetically. Finally, lavas may originate in rocks of widely different constitution, from crystalline rocks to the carboniferous clays which produce anorthite lavas. The indispensable factor, the tendency to increase in volume, may of course be supplied by other substances than water: as, for example, by chlorides, like masses of rock-salt, which would explain the emanations from exceptional volcanoes, like those of Hawii, where the place of water-vapour is taken by hydrochloric acid; or by sulphates, or combustible carbon compounds.

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* Given by D'Urville, apparently because the weather cleared and allowed an observation for latitude when he approached the group.

GENERAL.

The Origin of the Compass.—Padre T. Bertelli has been making inquiries into the origin of the compass since the year 1866, and has made known the result of his researches in several Italian scientific periodicals. He has arrived at the conclusions that there is no allusion in Greek or Latin works or others up to the tenth century, A.D., to the directive power of the magnet; that this power was known and used by a few Chinese and Japanese mechanicians from the Christian era; that the first rough compass, a floating needle, was introduced into the Mediterranean about the tenth century by citizens of Amalfi, who made great improvements in its construction, and popularized it among Italian seamen; and that the compass was not in use until much later among the Arabs, who acquired a knowledge of it from the Italians. The names of those who introduced and improved the compass are, according to P. Bertelli, all unknown; and the tradition, dating from the second half of the sixteenth century, that a certain Flavio or Giovanni Gioia, Goia, or Gioa, was the original inventor, or added the last improvement, is totally untrustworthy. These conclusions were accepted by most scientific men in Italy and other countries, until, at the Geographical Congress held at Florence in 1898, Colonel Antonio Botto adopted the view of the Abbé Abondio Collina, that the compass was not of Chinese origin, but invented and perfected by the Amalfians, assisted by the knowledge of the properties of the magnet already acquired by the Greeks and Latins. In the *Memorie dell Accad. Pont. dei Nuovi Lincei*, vol. xx., and the *Rivista Geogr. Ital.*, 1902, P. Bertelli replies to his critics. He maintains his opinion that the polarity of the needle was unknown before the tenth century, and shows that the Chinese possessed "indicators of the south," used exclusively on the Emperor's journeys, and that a few Chinese and Japanese ships were steered by the floating needle. This primitive instrument was retained in the East and on the coast of Africa after improvements had been introduced by the Amalfians, and in the northern seas of Europe down to the seventeenth century. P. Bertelli holds that the last improvement, a compass-card moving with the needle, was introduced about the end of the thirteenth century.

Geography at the International Geological Congress, 1903.—The ninth International Congress of Geologists will be held at Vienna from August 20 to 27, 1903. The president of the Executive Committee is the Hon. E. Tietze, the new director of the Geological Survey, and president of the Royal Geographical Society of Vienna. Prof. C. Diener is the general secretary, and Profs. A. Penck and E. Richter, with Dr. August von Böhm, are members of the organizing committee. Amongst the proposed excursions, which will be of special geographical interest, are the following:—*Before the meeting:* A fourteen days' excursion to the volcanic regions of northern Bohemia, under the leadership of the geologists Rosindal, Kibsch, and Fr. E. Suess (jun.); a three days' excursion to the salt-mines of Wieliczka, in Galicia; a nine days' excursion, under the leadership of Prof. Uhlig, to the Carpathian "Klippen" and the Hohe Tatra; an excursion for fifteen days in the Salzkammegut, directed by Herren A. von Böhm, Fugger, Wäbner, and Kittl. *After the meeting:* An excursion for eight days to the southern Dolomites, conducted by Prof. C. Diener; excursions to the Zillerthal Alps and the Hohe Tameru (Venediger), and to Bosnia and Dalmatia; also a fourteen days' excursion to the glacier region of the Austrian Alps, under the leadership of Profs. Penck and Richter. Full details will be made known later.

The Thomson Gold Medal of the Queensland Geographical Society.—A notice has been issued by the Queensland branch of the Royal Geographical Society of Australia, with regard to the conditions of competition for the Thomson Gold Medal, the foundation of which was announced a year or two ago in the *Journal.* The subjects selected for the next four years are as follows: (1903) The Commercial Development, Expansion, and Potentialities of Australia; (1904) The Pastoral Industry of Australia, past, present, and probable future; (1905) The Geographical Distribution of Australian Minerals; (1906) The Agricultural Industry of Australia. The medal will be awarded each year to the author of the best original paper (provided it be of sufficient merit) on the corresponding subject, and the papers must be sent in before July 1 of each year. All communications on the subject are to be made to the Hon. Secretary of the Society, Brisbane.

Bequest to a Geographical Society.—The late Mr. John Dolbeer, of San Francisco, bequeathed to the Geographical Society of the Pacific the sum of five thousand dollars. For many years Mr. Dolbeer had been one of the Directors of the Society, and had taken a deep interest in all geographical matters upon the western coast of America, although, from having travelled largely, his interest embraced all geographical research.

Dr. Leo Reinisch.—The founder of Austrian Egyptology, Hofrath Prof. Dr. Leo Reinisch, celebrated his seventieth birthday on October 26 last. The occasion was celebrated by the striking of a medal, subscribed for by friends, colleagues, and pupils. On the obverse was a portrait, with the inscription, "Leo Reinisch, anno ætatis LXX.," and on the reverse a sphinx, and the inscription, "Multas invenit linguas, dum quæreret."

OBITUARY.

Charles George Alexander Winnecke.

CHARLES GEORGE ALEXANDER WINNECKE, F.R.G.S., F.R.A.S., the well-known explorer and surveyor, died in Adelaide on Wednesday, September 10. For the last three years his health had not been good. Through living on hard diet while away on his many exploring expeditions his digestive organs became seriously deranged, and it was from this the end came. Winnecke was born at Norwood, South Australia, on November 18, 1857. His parents were German colonists, who came to South Australia in the early days. He was educated at St. Peter's College, and entered the civil service in 1873. Mr. Goyder, who was then Surveyor-General of the Colony, soon recognized in Winnecke a capable youth, and before he attained the age of manhood he was placed in charge of a trigonometrical party. He first helped to survey the country west of Lake Torrens, after which he surveyed the country around the Alice springs (Central Australian) telegraph station. In addition to surveying a large area in the MacDonnell ranges, he made several traverses in different directions, and sketched in much of the adjacent country. Up to this time his work had been carried on with horses, and many a time he ran great risks of losing his life on the long dry stages. Finding insufficient scope for his energies, he left the civil service and started business on his own account as a private surveyor in Adelaide. While thus engaged he made extensive journeys through the interior, being always equipped with camels. The country to the east and south-east of the Alice springs, and between that and Lake Eyre, was mapped by him; also much of the country between Alice springs and Lake Nash in a north-easterly direction; he made traverses north-west to the overland telegraph line, and south-easterly into the south-west portion of Queensland from that line. He did a great deal towards indicating correctly the flow of the flood-waters in the lower portions of the Barcoo, Thompson, Diamentina, Herbert, Cooper, and other rivers. Not only did he place his own observations on record, but he collected and correlated information from every available source, the result of which is seen in the many maps he has prepared. The only really good map of the northern territory—viz. that on which the geological features are added by Mr. H. Y. L. Brown, the Government geologist—was compiled and drawn by Winnecke, and very much of the topography of the geological map of South Australia is due to him. He was a most energetic worker, and at the time of his death, though comparatively only a young man, he was probably the best authority on Central Australian geography. So great was his reputation in this respect that he was made referee for all comers, and he found great pleasure in affording any information he possessed. He became a Life Fellow of this Society in 1885. He was also a fellow of the Royal Astronomical Society. He was a good observer, and his work was as perfect as the circumstances permitted; he spared neither time nor pains to perfect his work in every detail, and his maps are models of accuracy and lucidity. In 1894 Mr. W. A. Horn promoted a scientific expedition to the MacDonnell ranges, principally the watershed of the Finke river, and Winnecke was appointed the leader. The results of this expedition are recorded in the transactions of the Geographical Society of South Australia, together with a map, and also in a book on the Horn Expedition. The *personnel* of the party included several prominent scientists, and the trip was successful in adding much new data to the geographical, geological, zoological, ethnological, and other sciences. Winnecke was of a gentle, kindly disposition, but a very determined man as a leader, and brooked no interference. He was absolutely without fear of the natives, and on different occasions nearly lost his life by them attacking him. He took great interest in the natives, and many a time he was found championing their cause in the interior against some stockman or teamster who was oppressing them. During his earlier years of travel, Winnecke collected botanical specimens in great quantity for the late Baron Von Mueller, of Melbourne. He was fond of ornithology, and collected largely of birds, stuffing and mounting them himself; also birds' nests and birds' eggs. He possessed true scientific instincts. He had a considerable collection of snakes, lizards, insects, and animals. Perhaps the best and most interesting was his collection of aboriginal weapons, utensils, and ornaments. He prized these highly, and it is one of the finest private collections in Australia. Winnecke also had got together a valuable library of works on Australian exploration, and his private collection of maps, plans, &c., relating to Central Australia was unique. About three years ago he married, and his wife lives to mourn his loss. C. C.

John Wesley Powell.

The death occurred on September 23, 1902, of John Wesley Powell—generally known to the public as Major J. W. Powell, from the commission which he held during the American Civil War—one of the foremost workers in the cause of science in the United States during the last half-century. Major Powell had been for many years an Honorary Corresponding Member of the Society. From an obituary notice by Mr. G. K. Gilbert, which appeared in *Science* for October 10, we take the following particulars respecting the career of the deceased savant.

Major Powell came of English parentage, his parents having emigrated to America shortly before his birth. His father was a Methodist preacher, and during his frequent absences from home, the duty of looking after the farm owned by the family devolved much on the son, even when a boy. It was at this period that he acquired his scientific bent, paying much attention to natural history studies, in which he persevered after he had begun to support himself by teaching. Various journeys, including voyages on the Mississippi, Ohio, and Illinois, were carried out for the purpose of collecting specimens. These studies were for a time interrupted by the outbreak of the Civil War, on which he enlisted in the Illinois Volunteers, and devoted himself to military study and duties, principally in connection with the artillery, until its close, losing his right arm in the battle of Shiloh. The war ended, he became a teacher of geology at Bloomington and Normal, in Illinois, and in 1867 organized an important geological excursion to the mountain region of Colorado, where he stayed to explore after the return of the party. This was the beginning of a period of active work in the West, which led to the valuable results for which he is best known to geographers. A second and more important expedition, which received the countenance of the Government, wintered west of the Rocky mountains, and Powell's attention was then turned to the scientific study of the Indians, with which his name became afterwards intimately connected. In the following spring the bold and hazardous project was formed of the exploration of the cañons of the Green and Colorado rivers, through which the course of the streams was till then entirely unknown. The entirely successful result of this exploration made Powell's reputation, and led to the organization, under Government, of a Geographical and Geological Survey, which was also to collect ethnological data. For ten years, beginning with 1869, a thorough survey of the Colorado region was executed, the scope of the work being in course of time extended to the investigation of irrigation and water-supply questions in the arid region.

In 1879 Powell's survey was amalgamated, at his own suggestion, with that of Hayden, King, and Wheeler, the result being the creation of the present U.S. Geological Survey, of which Mr. King became first director. The Bureau of Ethnology was created at the same time to carry on the ethnological work, and of this Powell was made director, succeeding also to the directorship of the Geological Survey on Mr. King's resignation in 1881. Both organizations remained under his direction until 1894, when he gave up the geological work, which, under his administration, had included much research into water-supply questions. In the last years of his life the management of the Bureau of Ethnology passed into the hands of his principal assistant, Mr. McGee, while his own studies were directed towards the field of psychology and philosophy. He died at his summer home in Maine, at the age of sixty-eight years.

Besides the work for which he was directly responsible, Powell accomplished much through the medium of others who came under his influence, and to whom he communicated his ideas. Although his suggestion for the creation of a bureau for geography in connection with the survey, in addition to those of geology and ethnology, was not adopted, most important geographical work was done during his tenure of the directorship, as it still continues to be, the topographic division of the survey having been created by him. With his ethnological labours, important as they were, we are less concerned here. Perhaps the most important part of his work, from our point of view, were the novel ideas introduced by him into the study of surface features from the point of view of their genesis, especially in the case of the development of river-systems and the surface changes effected by running water. In this field he is to be regarded as the pioneer in the movement since further developed by modern students like Davis and others of his school.

Admiral Adeane.

The Society loses a Fellow of old standing by the death of Admiral Edward Stanley Adeane, C.M.G. The late Admiral was born in 1836, and entered the Navy at the age of fourteen. He served through the Baltic Expedition of 1854, and, as captain of the *Tenedos*, took part in the naval operations connected with the Zulu war of 1879. It was for this latter service that he gained his companionship. Two years previous, in 1877, Captain Adeane had become a Fellow of the Society. He became a rear-admiral in 1888, and attained the full rank ten years later. His death occurred on October 18.

Sir Juland Danvers.

On the same date as that of Admiral Adeane occurred the death of another distinguished Fellow of the Society, Sir Juland Danvers, K.C.S.I. Born in 1826, Sir Juland entered, at the age of sixteen, the London Offices of the East India Company. Remaining in this country, he became assistant-secretary of the company in 1858, and when, in the same year, the Imperial Government assumed control of the territories hitherto administered by the company, Danvers was appointed secretary in the Railway Department of the newly organized India Office. Three years later he obtained the post of Government Director of Indian Railway Companies, and in this capacity inspected, in 1875-76, the whole of the Indian railway system. From 1880 he also filled the post of secretary of the Public Works Department of the India Office. Sir Juland Danvers was knighted in 1886, and retired from the public service in 1892. He became a Fellow of the Society in 1884.

Dr. Bruno Hassenstein.

The well-known German cartographer, Dr. Bruno Hassenstein, died at Gotha on August 27 last, after a long and painful illness. Dr. Hassenstein, who was in his sixty-third year, was one of the foremost of the band of scientific map-makers, to whose labours Germany owes the undoubted lead she has obtained over other nations in this department of geography. Trained under the eye of August Petermann, Hassenstein was, during almost his entire career, connected with the famous firm of Perthes at Gotha, to the success of whose publications he has largely contributed. On the death of Petermann in 1878, he took over the direction of the map department of the *Mitteilungen*. Especially important were his contributions to African cartography by the working up of material brought home by travellers, one of the finest specimens of his work in this direction being the four-sheet map embodying the results of Dr. Junker's journeys. A later and perhaps still more important piece of work was the construction of the map of Tibet, on the scale of 1 : 1,000,000, which accompanied the scientific results of Dr. Sven Hedin's first great journey, and which not only embodied the topographical work of that traveller, but gave a complete representation of our knowledge of the region, as the result of all previous journeys.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *Mem. S.G. Genève* 41 (1902): 63-132. **Chodat and Pampanini.**

Sur la distribution des plantes des Alpes austro-orientales et plus particulièrement d'un choix de plantes des Alpes cadoriques et vénitiennes. Par R. Chodat et R. Pampanini. *With Maps.*

Alps—Glaciers. **Forel, Lugeon, Muret.**
Jahrb. Schweiz. Alpenclub. 37 (1901-1902): 193-218.

Les variations périodiques des glaciers des Alpes. Par Dr. F. A. Forel, Dr. M. Lugeon, E. Muret. (Vingt-deuxième rapport. 1901.)

Alps—Mont Blanc. *Jahrb. Schweiz. Alpenclub.* 37 (1901-1902): 244-276. **Coolidge.**

La Chaîne du Mont Blanc à travers les Siècles. Par W. A. B. Coolidge. *With Illustrations.*

On the development of a knowledge of Mont Blanc from 1901 onwards, commencing with a note on the history of political boundaries in the Mont Blanc region.

Austria—Bosnia and Herzegovina. *Monthly Rev.* 8 (1902): 72-87. **Villari.**

Austria-Hungary's Colonial Experiment. By L. Villari.

Describes the results, hitherto attained, of the Austrian occupation of Bosnia and Herzegovina.

Austria-Hungary. *Questions Dipl. et Colon.* 14 (1902): 222-241. **Jaray.**

Les nationalités en Autriche-Hongrie. Par Gabriel Louis Jaray.

Europe—Sugar Industry. *J.R. Statistical S.* 65 (1902): 419-446. **Guyot.**

The Sugar Industry on the Continent. By Yves Guyot.

France—Ardennes. *B.G. Hist. et Descriptive* (1901): 170-174. **Jadart.**

La limite occidentale du département des Ardennes, ancienne ligne de démarcation du Rémois et du Laonnois. Par H. Jadart. *With Map.*

France—Cartography. *B.G. Hist. et Descriptive* (1901): 209-212. **Pawlowski.**
Nouvelles cartes de Masse. Par Auguste Pawlowski.

An account of some recently discovered maps of the Cartographer Masse.

France—Dauphiné. *La G., B.S.G. Paris* **6** (1902): 17-26. **Kilian.**
Notes pour servir à la Géomorphologie des Alpes dauphinoises. Par W. Kilian. *With Maps and Illustration.*

France—Gascony. *B.G. Hist. et Descriptive* (1901): 111-119. **Fabre.**
L'Adour et le Plateau landais. Par L. A. Fabre. *With Map and Plan.*

On the development of the present hydrographical system by river-captures in the past.

France—Gascony. *B.G. Hist. et Descriptive* (1902): 132-148. **Fabre.**
La Magnétite Pyrénéenne dans les Sables Gascons. Par M. L. A. Fabre. *With Map and Diagram.*

France—Gironde. *B.G. Hist. et Descriptive* (1901): 194-198. **Duffart.**
Le lac de Lacanau en 1700 et 1900. Par Ch. Duffart. *With Map.*

The soundings taken by C. Masse in 1700 permit an interesting comparison to be made between the contours of the lake then and now, showing that alluvial deposits have reduced the depth to less than one-half.

France—Vosges. *B.G. Hist. et Descriptive* (1901): 175-185. **Guyot.**
La forêt de Darney. Par Ch. Guyot.

A study in historical geography.

Germany—Geodesy. ———
Veröffentlichung des Königl. Preussischen Geodätischen Institutes. Neue Folge No. 9. Bestimmung der Polhöhe und der Intensität der Schwerkraft in der Nähe des Berliner Meridians von Arkona bis Elsterwerda sowie auf einigen anderen Stationen nebst Azimutmessungen auf drei Stationen. Berlin: P. Stankiewicz, 1902. Size 10 × 7, pp. 302. *Diagrams.*

Germany—Samland, etc. **Zweck.**
Samland, Pregel- und Frischingthal. Eine Landes- und Volkskunde. Von Prof. Dr. Albert Zweck. Stuttgart: Hobbing & Buchle, 1902. Size 8¼ × 5¼, pp. viii. and 160. *Plans and Illustrations. Price* 4 *marks. Presented by the Publishers.*

One of the excellent regional studies, founded on a scientific basis, for which the Germans are famous. The first hundred odd pages are devoted to a detailed description of the surface features, and, after brief sketches of the climate, flora, and fauna, the remainder of the book deals with the people and their industries. The want of a map is, however, a serious one.

United Kingdom—Rivers. *Geological Mag. N.S.* **9** (1902): 366-375. **Buckman.**
River Development. By S. S. Buckman. *Illustrations.*

This is noticed in the Monthly Record.

United Kingdom—Scotland—Lakes. *Scottish G. Mag.* **18** (1902): 413-422. **Chumley.**
The Survey of British Lakes. By James Chumley.

The main results of the survey down to July were summarized in the August *Journal* (*ante*, p. 224).

United Kingdom—Wales. *P.I. Civil Engineers* **147** (1902): 290-307. **Oswell.**
Port Dinorwic Docks. By Frank Oswell. *With Plate.*

United Kingdom—Yorkshire. *Quarterly J. Geology. S.* **58** (1902): 471-571. **Kendall.**
A System of Glacier Lakes in the Cleveland Hills. By P. F. Kendall. *With Maps and Illustrations.*

ASIA.

Arabia—Yemen. *Z. Ges. Erdk. Berlin* (1902): 593-610. **Burchardt.**
Reiseskizzen aus dem Yemen. Von Hermann Burchardt. *With Map and Illustrations.*

The outward route led from Hodeideh to Sanaa, journeys being subsequently made in various directions through the province. The year in which the journey was made does not appear.

Asia Minor. *Sitzb. K.A.W. Wien* 110 (1901) (Abth. I.): 5–18. **Schaffer.**

Geologische Studien im südöstlichen Kleinasien und in Nordsyrien. Von Dr. Franz Schaffer. *Diagrams.*

Dr. Schaffer's explorations have been frequently referred to in the *Journal.*

Ceylon. **Warren.**

Ceylon. Administration Reports, 1901. Part ii. Scientific: Survey Department. Report of Mr. P. D. Warren, Acting Surveyor-General. Size 13½ × 8½, pp. 30. *Maps and Plate. Presented by the Surveyor-General of Ceylon.*

Ceylon. **Thorburn.**

Ceylon. Report for 1901. Colonial Reports, Annual No. 367, 1902. Size 9½ × 6, pp. 54. *Price* 3*d.*

China—Shantung. *B.S.G. de l'Est* 23 (1902): 53–83. **Hagen.**

Quelques mots sur la province du Chantoung (Chine). Son Commerce, sa population, son avenir. Traduit de l'anglais avec notes, par le Dr. A. Hagen.

India—Bibliography. **Dey.**

The Geographical Dictionary of Ancient and Mediæval India, with an Appendix on Modern Names of Ancient Indian Geography. By Nundo Lal Dey. Calcutta: W. Newman & Co., 1899. Size 10 × 6, pp. iv., 110, and 86. *Price* 10*s.* 6*d. net. Map.*

A useful book of reference for the ancient geography of India. In the first part the ancient names appear in alphabetical order, with their modern equivalents and explanations of their meanings and origin; in the second the order is reversed.

India—Madras. **Foster.**

The Founding of Fort St. George, Madras. By William Foster. London: Printed by Eyre & Spottiswoode, 1902. Size 8½ × 5½, pp. iv. and 44. *Price* 1*s.*

This will be noticed elsewhere.

India—North-West Frontier. **Davidson.**

Notes on the Bashgati (Kāfir Language). Compiled by Colonel J. Davidson. (Published as Extra No. 1 to the *Journal of the Asiatic Society of Bengal*, vol. lxxi. part. i., 1902.) Calcutta, 1902. Size 9 × 6½, pp. 196. *Price* 3*s. Presented by the Author.*

India—Survey Report. **Gore.**

General Report on the Operations of the Survey of India administered under the Government of India during 1900–1901. Prepared under the direction of Colonel St. G. C. Gore. Calcutta, 1902. Size 13½ × 8½, pp. iv., 68, and iv. *Maps and Plates. Presented by the Survey of India.*

This will be noticed elsewhere.

Indian Ocean—Maldive and Laccadive Islands. **Gardiner.**

The Fauna and Geography of the Maldive and Laccadive Archipelagoes. Being the account of the Work carried on and of the Collections made by an Expedition during the years 1899 and 1900. Edited by J. Stanley Gardiner. Vol. i. part iii. Cambridge: University Press, N.D. Size 11½ × 9, pp. 223–316. *Plates and Illustrations. Price* 15*s. net.*

The editor's section of this part gives the results of special observations on the formation and rate of growth of coral reefs.

Indian Ocean—Seychelles. **Escott.**

Seychelles. Report for 1901. Colonial Reports, Annual No. 364, 1902. Size 10 × 6, pp. 76. *Price* 4*d.*

Japan. **Brownell.**

The Heart of Japan. Glimpses of Life and Nature far from the Travellers' track in the Land of the Rising Sun. By Clarence Ludlow Brownell. London: Methuen & Co., 1902. Size 8 × 5, pp. xii. and 302. *Price* 6*s. Illustrations. Presented by the Publisher.*

Records the experiences and impressions of a European resident in the interior of Japan, far from the beaten tracks followed by most travellers. The author, who, during his five years' sojourn, always lived like the natives, has endeavoured, with success, to represent to his readers the inner spirit of native life, an insight into which is not to be obtained in the districts brought under the influence of European ideas.

Russia—Caucasus and Turkestan. *Rev. G.* **51** (1902): 151–170. **Barré.**

Le peuplement et la colonisation du Caucase et du Turkestan Russe. **Par Paul** Barré.

Russia—Kirghiz. *Scottish G. Magazine* 18 (1902): 393–406. **Brocherel.**

The Kirghiz. By Professor Jules Brocherel. *Map and Illustrations.*

Russia—Siberia. *G.Z.* **8** (1902): 450–465. **Friederichsen.**

Sibirien und die Gebirgsländer der russisch-asiatischen Grenzgebiete. Von Dr. Max Friederichsen.

Russia—Siberia. *Asien* **1** (1902): 75–76, 110–113. **Krahmer.**

Der nördliche Seeweg aus Sibirien nach Europa. Von Krahmer.

Russia—Siberia. *Questions Dipl. et Colon.* **14** (1902): 142–156. **Labbé.**

Les progrès de la colonisation en Sibérie. Par Paul Labbé.

Turkey. *Nineteenth Century* **52** (1902): 226–238. **Bell.**

Turkish Rule East of Jordan. By Gertrude Lowthian Bell.

Turkey—Babylonia. *Asien* **1** (1902): 101–105. **Wagner.**

Die Ueberschätzung der Anbaufläche Babyloniens. Von Prof. Dr. Hermann Wagner. *With Map.*

The author shows that the area of cultivable land in Babylonia has been enormously exaggerated by writers from Sprenger downwards, being commonly given **at** a figure exceeding the total area of the country.

AFRICA.

Abyssinia—Historical. **Littmann.**
Bijd. Taal-, Land- en Volkenk. Ned.-Indië **10** (1902): 477–500.

Jets over de betrekkingen tusschen Nederland en Abyssinie in de zeventiende eeuw. Door Prof. Dr. Enno Littmann.

Algeria. *B.S.G. Genève* **41** (1902): 158–167. **Hochreutiner.**

Une Mission Scientifique dans le Sud Oranais. Par B. P. G. Hochreutiner.

Algeria. **Gsell.**

Service des Monuments Historiques de l'Algérie. Les Monuments Antiques **de** l'Algérie. **Par** Stephane Gsell. Ouvrage publié sous les Auspices du Gouvernment Général de l'Algérie. 2 vols. Paris: A. Fontemoing, 1901. Size 10 × 6½, pp. (vol. i.) viii. and 290; (vol. ii.) 448. *Illustrations. Price* £1 14*s.*

An important and superbly illustrated work on the antiquities of Algeria.

British Central Africa. *Petermanns M.* **48** (1902): 169–172. **Maitre.**

Zwei Forschungsreisen der "Weissen Väter" nach Lobemba und Lobisa. Von Henri Maitre. *With Map.*

A summary of the geographical results of the journeys of the "White Fathers," also by M. Maitre, was given in the *Journal* for September, 1902 (p. 324).

Canary Islands—Palma. *Globus* **82** (1902): 117–125. **Burchard.**

Ein Besuch der Insel Palma. Von Dr. O. Burchard. *With Illustrations.*

Central Africa. **Oppenheim.**

Rabeh und das Tschadseegebiet. Von Dr. Max Freiherrn von Oppenheim. Berlin: Dietrich Reimer (Ernst Vohsen), 1902. Size 9 × 6, pp. x. and 200. *Map. Presented by the Author.*

The writer has done good service by bringing together within moderate compass **all** that is known of the career of the slave-adventurer, whose sudden rise to power **has** been followed, as is so often the case in Africa, by an equally sudden **downfall.** Chapters are also given on the history of the various native states surrounding **Lake** Chad, while an appendix treats of the caravan routes in that region. The map shows, in a bold style, the present political geography of the whole of North Africa.

Central Africa—Zoology. *T. Zoolog. S.* **16** (1902): 279–314. **Lankester.**

On Okapia, a new Genus of *Giraffidæ* from Central Africa. By E. Ray Lankester. *With Plates.*

East Africa. **Marsden.**

Trade and Customs Revenue of the East Africa Protectorate for the year ending March 31, 1902. Foreign Office, Annual No. 2903, September, 1902. Size 9½ × 6, pp. 16. *Price* 1*d.*

Egypt. **Ball.**

Survey Department, Public Works Ministry, Egypt. On the Topographical and Geological Results of a Reconnaissance-Survey of Jebel Garra and the Oasis of Kurkur. By John Ball, PH.D. Cairo: National Printing Department, 1902. Size 11 × 7½, pp. 40. *Maps and Illustrations.*

This will be noticed elsewhere.

Egypt. *Palestine Exploration Fund, Q. Statement* (1902): 407–411. **Watson.**

The Construction of the Great Pyramid of Gizeh. By Colonel C. M. Watson, C.B. *With Plan.*

Egypt—Cairo. **Reynolds-Ball.**

Cairo of To-day. A Practical Guide to Cairo and the Nile. By E. A. Reynolds-Ball. Third Edition. London: A. & C. Black, 1902. Size 6½ × 4½, pp. viii. and 256. *Maps, Plan, and Illustrations. Price 2s. 6d. Presented by the Publishers.*

Egypt—Magnetic Observations. *P.R.S.* 71 (1902): 1–25. **Lyons.**

Magnetic Observations in Egypt, 1893–1901. By Captain H. G. Lyons. *With Maps and Diagram.*

Egyptian Sudan. *B.S.G. Italiana* 3 (1902): 799–809. **Tappi.**

Da Lull a Fort Berkeley. Lettera del missionario P. C. Tappi al tenente di vascello L. Vannutelli.

Contains details as to the present position on the White Nile.

Sierra Leone—Mosquitos. *Army Medical Dep. Rep.* 42 (1900): 495–501. **Smith.**

The Distribution of Mosquito Larvæ on War Department Lands in Sierra Leone. By Captain F. Smith.

Sudan. *Petermanns M.* 48 (1902): 140–141. **Singer.**

Wo liegt Dikoa? Von H. Singer.

Discusses whether Dikoa (Rabah's capital in Bornu) lies in British or German territory.

Tripoli. **Dickson.**

Trade of Tripoli for the year 1901. Foreign Office, Annual No. 2843, July, 1902. Size 9½ × 6, pp. 10.

The trade with the Sudan is at present at a very low ebb, owing to the disturbances in Wadai and elsewhere.

Tripoli. **Jago.**

Trade and Economic State of Vilayet of Tripoli during the past forty years. Foreign Office, Miscellaneous, No. 578, July, 1902. Size 9½ × 6, pp. 16.

This is noticed in the Monthly Record (*ante*, p. 542).

Tripoli. *L'Esploraz. Com.* 17 (1902): 145–164. **Vigoni**

La Tripolitania. Conferenza dal Pippo Vigoni. *With Map.*

West Africa—Gravity Determinations. **Loesch.**

Reichs-Marine-Amt. Bestimmung der Intensität der Schwerkraft auf zwanzig Stationen an der westafrikanischen Küste von Rio del Rey (Kamerun-Gebiet) bis Kapstadt. Ausgeführt im Auftrage des Reichs-Marine-Amtes von M. Loesch. Berlin, 1902. Size 11½ × 9, pp. 50. *Map and Plate. Presented by the Staatssekretär des Reichs-Marine-Amts, Berlin.*

West Central Africa. **Lemaire.**

Rev. G. 50 (1902): 499–516; 51 (1902): 50–68, 134–150.

Les Wamboundous, les colporteurs noirs entre l'Atlantique et le Ka-Tanga. Par Capitaine Lemaire. *With Map.*

NORTH AMERICA.

Alaska. *B.U.S. Geolog. Surv. No.* 187, *Washington*, 1902, *pp.* 446. **Baker.**

Geographic Dictionary of Alaska. By Marcus Baker.

Contains much useful information on the history of Alaskan nomenclature.

America—Political Geography. *Nineteenth Century* 52 (1902): 533–553. **Pollock**

The Monroe Doctrine. By Sir Frederick Pollock, Bart.

Canada—Census. ———

Fourth Census of Canada, 1901. Bulletins i.—ix. Ottawa, 1901-1902. Size 10 × 6½, pp. 8, 12, 10, 8, 8, 10, 8, 16, and 14.

Canada—Rocky Mountains. *Travel* 7 (1902): 243-248. **Steele**

On a New Trail; or, Over the Rockies and the Selkirks of Canada. By Louis J. Steele. *Illustrations.*

Lake Erie. *Monthly Weather Rev.* 30 (1902): 312. **Harris.**

Note on the Oscillation Period of Lake Erie. By R. A. Harris. *Diagram.*

Mexico—Mt. Orizaba. *Popular Sci. Monthly* 61 (1902): 528-535. **Crook.**

An Ascent of Mt. Orizaba. By Prof. A. R. Crook. *With Illustrations.*

North America. **Weeks.**

B.U.S. Geolog. Surv. Nos. 188 *and* 189, *Washington,* 1902, *pp.* 718 *and* 338.

Bibliography of North American Geology, Paleontology, Petrology, and Mineralogy for the years 1892-1900, inclusive, by Fred Boughton Week (No. 188). Index to same (No. 189).

Brief statements of the general bearing and contents of the works are given. The index groups the entries under subject-headings.

United States. **Wilson and Others.**

B.U.S. Geolog. Surv. No. 181, *Washington,* 1901, *pp.* 240.

Results of Primary Triangulation and Primary Traverse, fiscal year 1900-01. By H. M. Wilson, J. H. Renshawe, E. M. Douglas, and R. M. Goode. *Map.*

The map shows the position of the survey as regards astronomically fixed positions and extent of country covered by primary triangulation in June, 1901.

United States—California. *J. Franklin I.* 154 (1902): 193-199. **Carter.**

Death Valley. By Prof. Oscar C. T. Carter.

United States—California. *J.G.* 1 (1902): 297-303. **Chamberlain.**

Climatic Conditions in Southern California. By Prof. J. F. Chamberlain.

United States—California. *B.S.G. Lyon* 17 (1902): 843-860. **Privat-Deschanel.**

L'État de Californie. Par Prof. Paul Privat-Deschanel. *Also separate copy, presented by the Author.*

An interesting study in Regional Geography.

United States—Colorado. **Ransome.**

B.U.S. Geolog. Surv. No. 182, *Washington,* 1901, *pp.* 266.

A Report on the Economic Geology of the Silverton Quadrangle, Colorado. By Frederick Leslie Ransome. *Maps, Plates, and Diagrams.*

United States—Commerce. ———

Commercial Relations of the United States with Foreign Countries during the year 1901. In two Volumes. Volume ii. Issued from the Bureau of Foreign Commerce, Department of State. Washington, 1902. Size 9 × 6, pp. 984.

United States—Corundum. **Pratt.**

B.U.S. Geog. Surv. No. 180, *Washington* 1901, *pp.* 98.

The occurrence and distribution of Corundum in the United States. By Joseph Hyde Pratt. *Maps, Plates, and Diagrams.*

United States—Lake Bonneville. *Scottish G. Mag.* 18 (1902): 449-471. **Talmage**

Lake Bonneville—The Predecessor of the Great Salt Lake. By Prof. James E. Talmage. *With Map and Illustrations.*

United States—Maryland. ———

Maryland Geological Survey. Vol. iv. Baltimore: The Johns Hopkins Press, 1902. Size 10½ × 7, pp. 524. *Maps and Illustrations.*

Besides the strictly geological matter, which includes a discussion of the geologic history of Maryland, especially in Palæozoic times, this volume contains a report on the highways of the state and the steps taken to improve them.

United States—Massachusetts. *American J. Science* 14 (1902): 77-94. **Davis.**

The Terraces of the Westfield River, Mass. By W. M. Davis. *Illustrations.*

United States—Meteorology. *Monthly Weather Rev.* 30 (1902): 117-125. **Bigelow.**

Studies on the Statics and Kinematics of the Atmosphere in the United States. By Prof. Frank H. Bigelow. iii. The Observed Circulation of the Atmosphere in the High and Low Areas. General Description of the Vectors obtained by observation. *Diagrams.*

United States—New Jersey. **[Kümmel.]**

Geological Survey of New Jersey. Annual Report of the State Geologist for the year 1901. Trenton, N.J.: MacCrellish & Quigley, 1902. Size 9 × 5½, pp. 178. *Maps and Illustrations.*

United States—Report Chief of Engineers. ———

Annual Reports of the War Department for the fiscal year ended June 30, 1901. Report of the Chief of Engineers. 5 Parts and Supplement. (Reports of the Mississippi River Commission and Missouri River Commission.) Washington, 1901. Size 9½ × 6, pp. 3938 and 54. Supplement, pp. 428 and 54. *Maps and Illustrations. Presented by the Chief of Engineers, U.S. War Department.*

CENTRAL AND SOUTH AMERICA.

Argentine Republic. ———

The Argentine Year-book (1902). With which are incorporated the 'Anuario Pillado' and 'John Grant's Argentine Commercial Guide.' Buenos Aires: J. Grant & Son. London: Moorgate Publishing Co. Size 9 × 5½, pp. 524. *Illustrations.*

Argentine Republic. ———

Annuaire statistique de la ville de Buénos-Ayres. XI$^{\text{me}}$ Année, 1901. Buénos-Ayres, 1902. Size 11 × 7½, pp. xxiv. and 328.

Argentine Republic. *B.S.G. Italiana* 2 (1901): 723–744, 798–814. **Cipolletti.**

Repubblica Argentina: Territori del Rio Negro e. del Rio Colorado: descrizione, studi idrologici e proposte di colonizzazione. Del Cesare Cipolletti. *With Map.*

Bahamas. **Churchill.**

Bahamas. Report for 1901–1902 (with a Report on the Salt Industry of Inagua). Colonial Reports, Annual No. 365, 1902. Size 10 × 6, pp. 42. *Price 2½d.*

Barbados. **Hodgson.**

Barbados. Report for 1901–1902. Colonial Reports, Annual No. 368, 1902. Size 10 × 6, pp. 56. *Price 3d.*

Bolivia. ———

Cámaras Legislativas de 1902. Memoria presentada por el Ministro de la Guerra y Colonizacion. La Paz: J. C. Tapia, 1902. Size 11 × 7½, pp. 28.

Bolivia and Brazil. **Ballivian.**

Comisión Boliviana Demarcadora de Limites con el Brasil, 1901. Informe del Comisario en Jefe Adolfo Ballivian. Segunda Edicion. Size 9½ × 6, pp. 106. *Map.*

As already noted in the *Journal*, this expedition has done work of much importance for the mapping of the region of the Brazil-Bolivian frontier. A list of positions fixed astronomically is given. The map is merely a sketch of the source region of the Yavari.

Brazil—Pará. *Meteorolog. Z.* 19 (1902): 348–366. **Goeldi.**

Zum Klima von Pará. Von Prof. Dr. E. A. Goeldi.

Chile and Argentina. **Fonck.**

Examen Crítico de la Obra del Señor Perito Arjentino Francisco P. Moreno. Por Francisco Fonck, como contribucion a la defensa de Chile. Valparaiso: C. F. Niermeyer, 1902. Size 10 × 7, pp. xii. and 146. *Maps and Diagrams. Presented by the Author.*

Presents the Chilian side of the boundary question with Argentina, from the point of view of a private individual well acquainted with the localities in dispute. It is useful also as an orogeographical study of the Southern Andes.

West Indies—Martinique and St. Vincent. **Diller.**
National G. Mag. 13 (1902): 285–296.

Volcanic Rocks of Martinique and St. Vincent. Collected by Robert T. Hill and Israel C. Russell. Described by J. S. Diller.

West Indies—Martinique and St. Vincent. **Hill.**
National G. Mag. 13 (1902): 223–267.

Report by Robert T. Hill on the Volcanic Disturbances in the West Indies. *Map and Illustrations.*

West Indies—Martinique and St. Vincent. **Hillebrand.**
National G. Mag. 13 (1902): 296–299.

Chemical Discussion of Analyses of Volcanic Ejecta from Martinique and St. Vincent. By W. F. Hillebrand.

West Indies—Volcanic Dust. *National G. Mag.* 13 (1902): 299–301. **Page.**

Reports of Vessels as to the Range of Volcanic Dust. Compiled by James Page.

West Indies—Volcanic Eruptions. *National G. Mag.* 13 (1902): 267–285. **Russell.**

The Recent Volcanic Eruptions in the West Indies. A Letter to the National Geographic Society. By Israel C. Russell. *Map and Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Exploration. *G. Teacher* 1 (1902): 167–170. **Andrews.**

Physical Conditions and Exploration as illustrated by Australia. By A. W. Andrews.

Australia—Sailing Directory. ——

Revised Supplement, 1902, relating to the Australia Directory, vol. iii. Third Edition, 1895. London, 1902. Size 9½ × 6, pp. 60. *Price* 1*s*. *Presented by the Hydrographer, Admiralty.*

Fiji. **Sutherland.**

Fiji Report for 1901. Colonial Reports, Annual No. 366, 1902. Size 9½ × 6, pp. 18. *Price* 1½*d*.

New Zealand—Fjords. *J. of T. Victoria I.* 34 (1902): 152–163. **Maclaren.**

The Physical History of the Fjords of New Zealand. By J. Malcolm Maclaren.

Pacific. *Z. Ges. Erdk. Berlin* (1902): 583–592. **Heinroth.**

Die erste Deutsche Südsee-Expedition von Br. Mencke. Von Dr. O. Heinroth. *With Illustrations.*

Account of a voyage carried out in 1900–1901, for scientific objects, in the *Princess Alice*, formerly the property of the Prince of Monaco. See note, *ante*, p. 658.

Queensland. ——

Queensland. Annual Report of the Under-Secretary for Mines to the Honourable Robert Philp, including the Reports of the Wardens, Inspectors of Mines, Government Geologist, Government Analyst, and other Reports, for the year 1901. Brisbane, 1902. Size 13½ × 8½, pp. 212. *Maps and Illustrations.*

Queensland. *J. of T. Victoria I.* 34 (1902): 182–196. **Jack.**

Artesian Water in the State of Queensland, Australia. By R. Logan Jack, LL.D.

Tasmania—Geology. *Papers and P.R.S. Tasmania* (1900–1901): 58–74. **Twelvetrees.**

Outlines of the Geology of Tasmania. By W. H. Twelvetrees.

Tasmania—Magnetic Survey. **Hogg.**
Papers and P.R.S. Tasmania (1900–1901): 81–88.

The Magnetic Survey of Tasmania. By Prof. E. G. Hogg.

Traces the history of magnetic observations in Tasmania, with an account of the proposed survey.

Tasmania—Timber. *Papers and P.R.S. Tasmania* (1900–1901): 21–37. **Heyn.**

Present and Future Prospects of Timber in Tasmania. By W. Heyn.

Victoria—Aborigines. ——

Thirty-seventh Report of the Board for the Protection of the Aborigines. Melbourne, 1901. Size 13½ × 8½, pp. 12. *Presented by the Secretary of State for the Colonies.*

Western Australia. ——

1902. Western Australia. Report of the Department of Mines (Preliminary) for the year 1901. Perth: W. A. Watson, 1902. Size 13 × 8, pp. 44. *Presented by the Under-Secretary for Mines.*

Western Australia—Geology. ——

Western Australia. Annual Progress Report of the Geological Survey for the year 1900. Perth, 1901. Size 13 × 8½, pp. 34. *Plans, Sections, and Illustrations.*

POLAR REGIONS.

Antarctic. **Bruce.**

The Scottish National Antarctic Expedition. By W. S. Bruce. (Read at the British Association Meeting, Belfast, September 16, 1902.) Size 10 × 6, pp. 4. *Map. Presented by the Author.*

Printed also, with illustrations, but no map, in the *Scottish Geographical Magazine* 18 (1902), pp. 536–543.

Antarctic—German Expedition. *Z. Ges. Erdk. Berlin* (1902): 635–642. **Schott.**

Von der Deutschen Südpolar-Expedition, Nach den amtlichen Berichten der Expedition über die Fahrt von Kapstadt bis zu den Kerguelen. Bearbeitet von Dr. G. Schott.

Arctic. **Kersting.**

The White World. Life and Adventures within the Arctic Circle portrayed by famous living explorers. Collected and arranged for the Arctic Club by Rudolf Kersting. Issued under the auspices of the Arctic Club. New York: Lewis, Scribner & Co., 1902. Size 8½ × 6, pp. 386. *Illustrations. Price* $2.00 *net. Presented by Dr. Robert Stein.*

Personal experiences in the arctic of twenty-two living American travellers, including some well-known names, *e.g.* Admiral Schley, Major Brainard, Dr. F. A. Cook, Mr. H. L. Bridgman, and Dr. Robert Stein.

Arctic. *Rev. Scientifique* **18** (1902): 494–498. **Péroche.**

Les abords du pôle. Par M. J. Péroche. *Also separate copy presented by the Author.*

Summarizes the meteorological and glacial conditions in the arctic, and discusses the way in which the pole can be best reached.

Arctic—Bear Island. **Andersson.**

Ueber die Stratigraphie und Tektonik der Bären Insel. Inaugural-Dissertation von J. G. Andersson. (Sonderabdruck aus Bull. of the Geol. Inst. of Upsala, No. 8, vol. iv. Part 2, 1899.) Upsala, 1901. Size 10 × 6½, pp. 38. *Sketch-map and Profiles. Presented by the Author.*

Cf. note in the *Journal* for August, 1901 (vol. xviii. p. 215).

Arctic—Flora. **Gelert and Ostenfeld.**

Flora Arctica, containing descriptions of the Flowering Plants and Ferns found in the Arctic Regions, with their distribution in these Countries, illustrated by numerous figures in the Text. Edited by C. H. Ostenfeld. Part i. Pteridophyta, Gymnospermæ, and Monocotyledons. By O. Gelert and C. H. Ostenfeld. Published by the Carlsberg Fund. Copenhagen: Det Nordiske Forlag, 1902. Size 10½ × 7, pp. xi. and 136. *Illustrations. Presented by the Publishers.*

This important work, of which Part i. is now published, was commenced at the suggestion of Prof. Warming in 1896, being at first entrusted to Mr. O. Gelert, whose early death in 1899 was an unfortunate hindrance to its progress. Mr. Ostenfeld, the present editor, had, however, assisted Mr. Gelert in the work during his lifetime, and has proved a competent successor. From a geographical point of view, the chief value of the work lies in the full information given as to the distribution of the species, a knowledge of which is of importance for so many of the physical problems of the arctic.

MATHEMATICAL GEOGRAPHY.

Cartography. *M.K.K.G. Ges. Wien* **45** (1902): 173–212. **Stavenhagen**

Frankreichs Kartenwesen in geschichtlicher Entwickelung. Von W. Stavenhagen.

Surveying. **Whitelaw**

Surveying as practised by Civil Engineers and Surveyors, including the Setting-out of Works for Construction and Surveys Abroad, with Examples taken from actual practice: intended as a Handbook for Field and Office use, also as a Text-book for Students. By John Whitelaw, junr. London: Crosby Lockwood & Son, 1902. Size 8½ × 5½, pp. xvi. and 516. *Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

This will be noticed elsewhere.

Surveying—Methods. **Longe.**
Survey of India. Professional Paper No. 2 of 1902. Account of a Determination of the Coefficients of Expansion of the Wires of the Jäderin Base-Line Apparatus. Prepared under the direction of Major F. B. Longe. Dehra Dun, 1902. Size 10½ × 8½, pp. 14. *Illustrations.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Avalanches. *Jahrb. Schweiz. Alpenclub* 37 (1901-1902): 219-243. **Sprecher.**
Grundlawinenstudien II. Von F. W. Sprecher. *With Illustrations.*

Erosion. *Mém. S.G. Genève* 41 (1902): 1-12. **Chaix.**
Érosion torrentielle post-glaciaire dans quelques vallées. Par Émile Chaix. *With Plates.*

Illustrated by excellent photogravures, the examples being taken from the Alps.

Glacial Epoch. **Credner.**
Das Eiszeit-Problem. Wesen und verlauf der diluvialen Eiszeit. Ein Vortrag von Rudolf Credner. (Sonderabdruck aus dem VIII. Jahresbericht der Geographischen Gesellschaft zu Greifswald, 1901-1902.) Greifswald: Druck von Julius Abel, 1902. Size 9¼ × 6½, pp. 16. *Presented by the Author.*

Ice Age. **Longe.**
The Fiction of the Ice Age or Glacial Period. By Francis D. Longe. Lowestoft: McGregor & Fraser, 1902. Size 8¼ × 5½, pp. 78. *Presented by the Author.*

The writer's arguments are hardly likely to prove convincing to geologists.

Limnology—Warm Lakes. *Petermanns M.* 48 (1902): 189-190. **Häpke.**
Warmwasserseen und heisse Salzteiche. Von Prof. Dr. Häpke.

Describes and discusses warm-water lakes in Scandinavia, Siberia, and Hungary.

Meteorology. **Assmann and Berson.**
Veröffentlichungen des Königlich Preussischen Meteorologischen Instituts. Ergebnisse der Arbeiten am Aëronautischen Observatorium in den Jahren 1900 und 1901. Von Richard Assmann und Arthur Berson. Berlin: A. Asher & Co., 1902. Size 13 × 10, pp. 278. *Maps, Diagrams, and Illustrations. Price* 15*m. Presented by the Institute.*

Meteorology. **Berry and Phillips.**
Proceedings of the Second Convention of Weather Bureau officials held at Milwaukee, Wis., August 27, 28, 29, 1901. Edited by James Berry and W. F. R. Phillips. (U.S. Department of Agriculture, Weather Bureau. Bulletin No. 31.) Washington, 1902. Size 9½ × 5½, pp. 246. *Maps and Illustrations. Presented by the U.S. Weather Bureau.*

Meteorology. *Petermanns M.* 48 (1902): 173-178. **Brückner.**
Zur Frage der 35 jährigen Klima-Schwankungen. Von Prof. Dr. E. Brückner.

Meteorology. *Monthly Weather Rev.* 30 (1902): 181-183. **Rotch.**
The circulation of the Atmosphere in the tropical and equatorial regions. By A. Lawrence Rotch. *With Diagrams.*

Oceanography. *Ann. Hydrographie* 30 (1902): 390-395. **Krümmel.**
Ueber die ozeanographischen Ergebnisse der deutschen Südpolar-Expedition von Kiel bis Kapstadt. Von Prof. Dr. O. Krümmel.

Tides. **Harris.**
Treasury Department, U.S. Coast and Geodetic Survey. Physical Hydrography. Manual of Tides. Part IVA. Outlines of Tidal Theory. By Rollin A. Harris. Appendix No. 7, Report for 1900. Washington, 1901. Size 12 × 9½, pp. 533-700. *Charts and Diagrams. Presented by the U.S. Coast and Geodetic Survey.*

The author approaches the problem from a somewhat different standpoint to other authorities, dealing rather with actual tidal motions than with hypothetical cases. He considers that this method, though containing little that is really new, is more promising than those generally adopted.

Volcanoes. *Rev. Scientifique* 18 (1902): 129-135. **Meunier.**
Théorie du phénomène volcanique à propos de la récente catastrophe des Antilles. Par Stanislas Meunier.

See note, *ante*, p. 659.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Colonization. **Ireland.**

Is Tropical Colonization Justifiable? By Alleyne Ireland. (Publications of the American Academy of Political and Social Science No. 335.) Philadelphia, N.D. Size 9 × 5½, pp. 10. *Price 15 cents. Presented by the Author.*

Commercial Geography—Platinum. **Kemp.**
B.U.S. Geolog. Surv. No. 193, *Washington*, 1902, *pp.* 96.

The Geological Relations and Distribution of Platinum and Associated Metals. By James Furman Kemp. *Maps, Plates, and Diagram.*

BIOGRAPHY.

Buache. *B.G. Hist. et Descriptive* (1901): 269-274. **Vuacheux.**

Un mémoire et une lettre du géographe Philippe Buache (1763). Par F. Vuacheux.

Cam and Behaim. *B.S.G. Anvers* **26** (1902): 182-204. **Mees.**

Diego Cam et Martin Behaim. Par M. le Dr. Jules Mees.

Laudonnière. *B.G. Historique et Descriptive* (1902): 53-65. **Hamy.**

Le Capitaine Réné de Laudonnière. Nouveaux reseignements sur ses Navigations (1561-1572). Par M. le docteur E. T. Hamy.

Dr. Hamy has brought to light documents which throw new light on the life of Laudonnière before and after his voyages to Florida.

Powell. *Science* **16** (1902): 561-567. **Gilbert.**

John Wesley Powell. By G. K. Gilbert. *With Portrait.*

GENERAL.

Africa and Australasia. *Deutsche Rundschau* **24** (1902): 551-566. **Umlauft.**

Fortschritte der Geographischen Forschungen und Reisen im Jahre 1901. 3, Afrika. 4, Australien und die Sudsee. Von Dr. Fr. Umlauft.

Encyclopædia Britannica. ——

The New Volumes of the Encyclopædia Britannica, constituting, in combination with the existing volumes of the Ninth Edition, the Tenth Edition of that Work, and also supplying a new, distinctive, and independent Library of Reference dealing with recent events and developments. The fourth and fifth of the new volumes being volumes xxviii. and xxix. of the complete work. Published by A. & C. Black: Edinburgh and London; and the *Times*, London, 1902. Size 11 × 8½, pp. (vol. iv.) xx. and 742, (vol. v.) xx. and 764. *Maps, Plates, and Illustrations.*

These volumes include articles on England and Wales (by Dr. H. R. Mill and I. P. Renwick), Europe (by G. G. Chisholm), France, Geography (by Dr. Mill), Germany (by Dr. H. Wagner and others), Himalayas (by Sir T. Holdich), Greenland (by Dr. Nansen), India, Indian ocean (by H. N. Dickson), Italy, etc., etc.

French Colonies. **Mourey.**

Chronique Coloniale (1900). Par Charles Mourey. (Extrait, Annales des Sciences Politiques, Juillet 1901, pp. 498-512.) Ditto (1901), by the same. (*Ibid.*, 15 Juillet, 1902, pp. 522-533.) Paris: F. Alcan, 1901-1902. Size 13 × 6½. *Presented by the Author.*

Northern Africa and Iberian Peninsula. **Brunhes.**

Étude de Géographie Humaine. L'Irrigation, ses conditions géographiques, ses modes, et son organisation dans la Péninsule Ibérique et dans l'Afrique du Nord. Par Jean Brunhes. Paris: C. Naud, 1902. Size 10 × 6½, pp. xviii. and 580. *Maps and Illustrations. Presented by the Author.*

This will be specially noticed.

Pacific. *National G. Magazine* **13** (1902): 303-318. **Austin.**

Problems of the Pacific. The Commerce of the Great Ocean. By Hon O. P. Austin. *Maps.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from October 1 to 31, 1902.

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England and Wales. **Geological Survey.**

Maps (1-inch). New Series (colour-printed). Stoke-upon-Trent, Sheet 123 (Solid and Drift Editions). 1*s.* 6*d. each.*

MEMOIRS:—

South Wales Coal Field. Part iii. The Geology of the Country around Cardiff, being an account of the region comprised in sheet 263 of the map. 2*s.* 3*d.*

The Geology of the Country around Stoke-upon-Trent. (Explanation of sheet 123.) 1*s.* 6*d.*

(*E. Stanford, London Agent.*)

England and Wales. **Railway Clearing House.**

Official Railway Map of England and Wales, prepared and published at the Railway Clearing House, London, 1901. Drawn and engraved by J. & W. Emslie. Scale 1 : 475,200 or 7·5 stat. miles to an inch. 4 sheets. London: Railway Clearing House.

Shows the various railways and railway systems of England and Wales up to last year. The different companies' lines are indicated by various colours. The map is not obscured by the introduction of hill-shading or other matter having little or no connection with railway communication.

Germany. **Königl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheets: 174, Varel; 233, Cloppenburg. Herausgegeben von der Kartogr. Abtheilung der Kgl. Preuss. Landes-Aufnahme, 1902. *Price* 1.50 *marks each sheet.*

Sweden. **Sveriges Geologiska Undersökning.**

Sveriges Geologiska Undersökning. Scale 1: 50,000 or 0·78 stat. mile to an inch. Sheets: "Medevi," "Ystad." 1900-02.—Scale 1 : 100,000 or 1·5 stat. mile to an inch. Sheets: Strömstad, Fjellbacka, Uddevalla, Göteborg, Kalmar. 1900-01.—Geologisk Karta öfver Blekinge Län med bidrag af Länets Hushållningssällskap. Scale 1 : 100,000 or 1·5 stat. mile to an inch. 2 sheets.—Geologisk Öfversigtskarta öfver Sveriges Berggrund. Scale 1 : 1,500,000 or 23·5 stat. miles to an inch. 2 sheets. 1901.—Öfversigtskarta öfver Jordarterna inom Nerike och Karlskoga Bergslag samt Fellingsbro Härd. Scale 1 : 125,000 or 1·9 stat. mile to an inch. 2 sheets.—Geologisk Atlas öfver Norbergs Bergslag på bekostrad af Jernkontoret upprättad 1892-93 af Sveriges Geologiska Undersökning genom Walfr. Petersson. *Price* 5 *kr.*—Atlas till underdånig betrattelse om en undersökning af mindre kända malmfyndigheter inom Jukkasjärvi malmtrakt och dess omgifningar verkstalld af Sveriges Geologiska Undersökning. Stockholm. *Presented by the Institut Royal Géologique du Suède.*

ASIA.

China. **Ferguson.**

Map of the Country round Suchau. Surveyed by Thos. Ferguson, 1900-1901. Scale 1 : 63,360 or 1 stat. mile to an inch. Shanghai: Kelly & Walsh, 1902. *Presented by Thos. Ferguson, Esq.*

Accompanying this map the author has forwarded a memorandum giving an account of the method of survey. A base-line of about a mile in length was measured with a tape, and from the ends of this rounds of sextant angles were taken to various prominent points. Some of these points were afterwards visited and their positions checked by a small theodolite. Subsequently about thirty-five trips were undertaken in various directions upon the many surrounding waterways, and the distances and directions automatically recorded by means of the "hodograph," an instrument somewhat similar to a ship's log, which Mr. Ferguson has invented, and with which he made the greater part of his surveys of the waterways near Shanghai, noticed in the *Geographical Journal* for August, 1901. Soundings are given in feet, reduced to the mean low-water level.

Dutch East Indies. **Stemfoort and Siethoff.**

Atlas der Nederlandsche Bezittingen in Oost-Indië, naar de nieuwste bronnen samengesteld en aan de regeering opgedragen door J. W. Stemfoort en J. J. ten Siethoff, Kapiteins van den Generalen staf van het Nederlandsch-Indisch leger. Gereproduceerd, op last van het Departement van Koloniën, aan de Topographische Inrichting te 's Gravenhage, onder leiding van den Directeur C. A. Eckstein. New edition. Sheets: 1, Overzichtskaart van den Nederlandsch Oost Indischen Archipel, scale 1 : 6,500,000 or 102·5 stat. miles to an inch; 2, Kaart van Java en Madoera, scale 1 : 2,000,000 or 31·5 stat. miles to an inch; 8, Zuid Sumatra, scale 1 : 900,000 or 14·2 stat. miles to an inch; 14, Kaart van Celebes, scale 1 : 200,000 or 31·5 stat. miles to an inch. Kaart van Zuid-West Celebes, scale 1 : 500,000 or 7·8 stat. miles to an inch. 1901.

The first edition of the atlas of the Netherland East Indies, to which these sheets belong, was published in 1883-85. Since that date revised sheets have occasionally appeared, and those now issued are dated 1900 and 1901. They are well executed, and printed in colours.

Indo-China. **Cupet, Friquegnon, De Malglaive and Seauve.**

Indo-Chine, carte de la Mission Pavie, dressée sous les auspices du Ministre des Affaires Etrangères et du Ministre des Colonies sous la direction de M. Pavie par MM. les Capitaines Cupet, Friquegnon, de Malglaive et Seauve. Scale 1 : 2,000,000 or 31·5 stat. miles to an inch. Paris: Augustin Challamel, 1902.

A good general map of French Indo-China, Siam, and adjacent parts of Burma and China, compiled from recent exploration and surveys. A new edition will doubtless soon be issued, showing the modifications to the boundary-line between the French and Siamese territories, which was not definitely arranged when this map was published.

Perak. **Young.**

Map of Perak. Scale 1 : 253,440 or 4 stat. miles to an inch. Alfred Young, A.M.I.C.E., F.R.A.S., chief Surveyor, Federated Malay States. 2 sheets. 1901. *Price* 10*s*.

This is by far the best map of Perak that has been published, although it will be seen at a glance that there are many districts that are still unexplored. In addition to the usual topographical features, the location of mining and agricultural areas, forest reserves, railways, open and constructing, roads, paths, telegraph lines and stations and boundaries are all shown, as well as much other useful information. The map is printed in colours, but it would have been an improvement if the water had been tinted blue, in order to distinguish more clearly the coast-line and rivers.

AFRICA.

Congo Free State. **Droogmans.**

Carte du Bas Congo. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Par H. Droogmans. Sheets 4 and 8 (new editions). Brussels: A. de Schaepmeester, 1902.

A comparison of these sheets with the earlier editions issued in December, 1900, will show that much new survey work has recently been accomplished. Sheet No. 4 includes the district of the lower Congo in the neighbourhood of Boma and Matadi, and No. 8 that immediately to the east. In addition to the usual graduation for latitude and longitude, there are marked on the borders of each sheet scales of kilometres, giving distances from the Equator and from the 20th degree of longitude east of Greenwich. By means of these scales, the distance in a straight line between any two stations on the map may be found by the usual formula $ac = \sqrt{ab^2 + bc^2}$, where *a* and *c* represent the two stations, *ab* the difference of latitude, and *bc* the difference of longitude in kilometres. This method may be employed with advantage when the places are on different sheets of the map. The sheets are photo-lithographs in black and white, and somewhat rough in appearance. The complete map consists of twelve sheets and supplements.

German South-West Africa. **Görgens.**

Besitzstands-Karte von Deutsch-Südwest-Africa. Stand am 1. Januar 1902. Aufgestellt im Bureau der Landesvermessung. Görgens, Kaiserlicher Oberlandmesser. Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. 2 sheets.

An outline-map of German West Africa, showing the boundaries and location of lands allotted to various companies and individuals, native lands, the property of the South-African Territories, Ltd., and other information of a similar character, up to January 1, 1902.

Madagascar. **Service Géographique du Corps d'Occupation.**

Carte de Madagascar. Dressée et tiré au Service Géographique du Corps d'Occupation, Lieut.-Colonel Gerard, Chef d'État Major, Capt. Merienne-Lucas, Chef der Bureau Topographique. Scale 1 : 100,000 or 1·5 stat. mile to an inch. Sheets: 208, 209, 210, 222, 223, 224, 234, 235, 236, 237, 247, 248, 249, 250, 259, 260, 261, 262, 271, 272, 273, 274, 282, 283, 284, 285, 293, 294, 295, 296. Service Géographique du Corps d'Occupation, Bureau topographique de Madagascar, 1899–1900.

Since the French occupation of Madagascar, rapid progress has been made with the surveying of the island. Already several good maps, on fairly large scales, have been issued by the Chief of the Topographical Bureau, and now a map is in progress of publication on the scale of 1 : 100,000, based upon recent surveys by French officers. The map, of which the above are the first thirty sheets, shows the relief by contour-lines in brown at intervals of 25 metres, rivers in blue, principal roads red, and forests green, minor roads, paths, and lettering in black. There are many districts shown on these sheets where it is evident that the surveys are of a preliminary nature, and doubtless new editions will be published as soon as more complete surveys have been made. The present sheets include the region around Tananarivo.

Tunis. **Babelon, Cagnat, and Reinach.**

Atlas Archéologique de la Tunisie. Edition Spéciale des cartes topographiques publiées par le Ministère de la Guerre accompagnée d'un texte explicatif par MM. E. Babelon, R. Cagnant, S. Reinach. 8e Livraison. Paris: Ernest Leroux, 1902.

The sheets of the 1 : 50,000 French Government survey of Tunis form the basis of this atlas, and upon these the archæological work, sites, and names of ancient towns have been shown in red. It is published under the direction of the Minister of Public Instruction and Fine Arts, and has been in progress for some years past.

West Africa. **Service Géographique des Colonies.**

Carte de l'Afrique Occidentale, dressée avec la collaboration du Service Géographique des Colonies. Scale 1 : 500,000 or 7·8 stat. miles to an inch. Sheets: 58, Sakhala; 59, Kouadiokofi; 67, San Pedro; 68, Bingerville. Paris: Henry Barrère, 1902.

These are the first four sheets of a general map of French West Africa, which, according to the index, will consist altogether of seventy-four sheets, and include the area from the Ivory Coast on the south to 21° 30′ N. lat. on the north, and from the West Coast on the west to the longitude of the Niger delta on the east, with two additional sheets extending to Lake Chad. Up to the present time, four sheets only have been published, Nos. 58, 59, 67, and 68, which include the Ivory Coast and the hinterland. These sheets have been compiled from the explorations and routes of various travellers, the latter being shown in red, together with the traveller's name; water is shown in blue, and hills in brown. Parts that have been sketched in from unreliable information or native reports are distinguished from those drawn from more trustworthy material.

AMERICA.

Brazil. **Azevedo.**

Carta Geographica do Estado do Rio Grande do Sul, organisada pelo engenheiro civil Francisco Braziliense da Cunha Lopes e pelo agrimensor João Luiz Nunes de Azevedo. Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. Paris: Erhard F^{res}, 1902.

A general map, printed in colours, of the state of Rio Grande do Sul, compiled from the latest information, which, however, in some parts is very meagre and imperfect. In the corners of the map are statistical tables giving altitudes of points along the railways and their distances from Porto Alegre and territorial divisions. Railways, working and proposed, are laid down.

Canada. **Surveyor-General's Office, Ottawa.**

Sectional Map of Canada. Scale 1 : 190,080 or 3 stat. miles to an inch. Cutarm Sheet (27), West of Principal Meridian, revised to June 11, 1902; Nut Mountain Sheet (37), West of Second Meridian, revised to August 4, 1902; Macleod Sheet (74), West of Fourth Meridian, revised to July 5, 1902. Surveyor-General's Office, Ottawa, Canada, 1902. *Presented by the Surveyor-General of Canada.*

Canada. **Tyrrell.**

Map of Exploration of Divide between Great Slave Lake and Hudson Bay, Districts of Mackenzie and Keewatin, Dominion of Canada, 1900. By J. W. Tyrrell, D.L.S. Scale 1 : 63,360 or 1 stat. mile to an inch. 22 Sheets and Index. Accompanying the 'Annual Report of the Department of the Interior for 1901.' Ottawa, 1901. *Presented by the Surveyor-General of Canada.*

A short account of the latest exploratory expedition to the Barren Lands of North America, under the leadership of Mr. J. W. Tyrrell, was given in the *Geographical Journal* for September last. The geographical results are shown upon the twenty-two sheets forming the present map, and are of considerable importance, the route having passed through a region which in certain parts was previously quite unexplored. Starting from Old Fort Reliance, on the eastern shore of Great Slave lake, the explorers travelled in a north-east and east direction, by way of Pike's portage, the Hanbury and Thelon rivers, to Baker lake and Chesterfield inlet. Pike's portage was made the initial point of the survey, and was found by astronomical observations to be in lat. 62° 42′ 2″·4 N., and long. 108° 44′ 55″ W. The exact character of the observations is not specified, but no doubt the determinations may be taken as fairly correct. The course of the Thelon river is laid down for the first time with a fair amount of accuracy, in addition to which it will be seen that the map contains a considerable amount of information that is new, although it can hardly be claimed that it is the result of anything more than a route survey, and no attempt has been made to show the graduation of latitude and longitude. The map forms a supplement to Mr. Tyrrell's report contained in the 'Annual Report of the Department of the Interior for 1900–1,' where is also to be found a list of the places fixed in latitude and longitude, variation of compass, distances, and meteorological observations made during the expedition.

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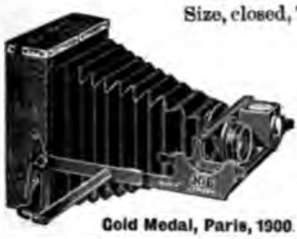

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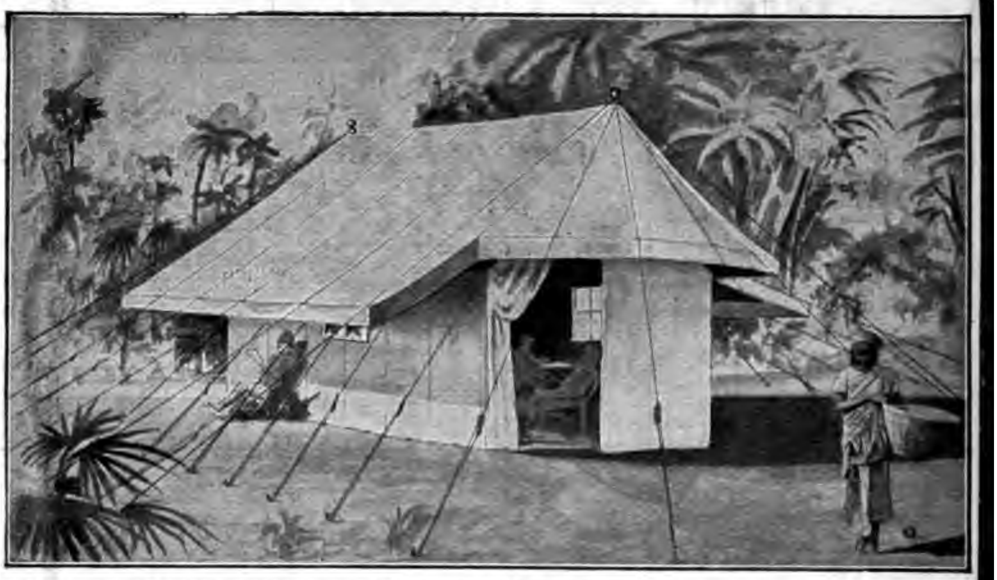

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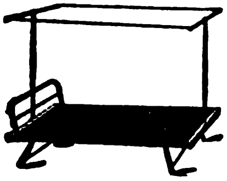

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